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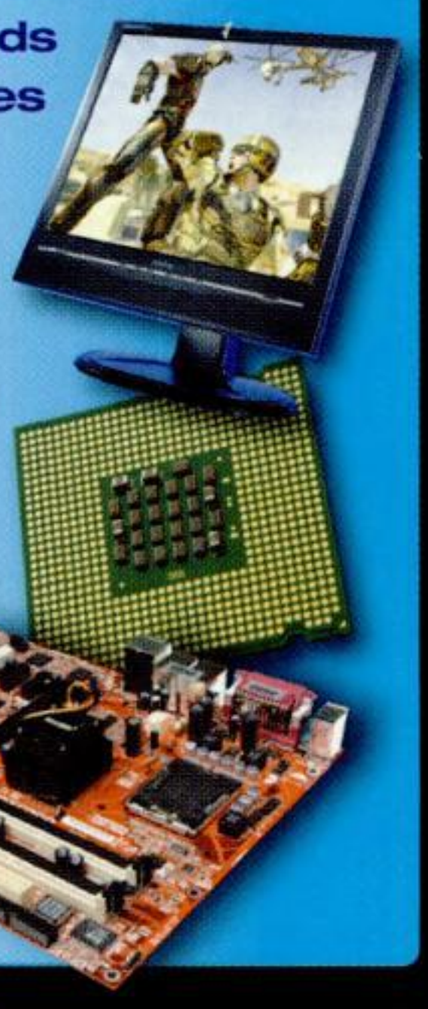

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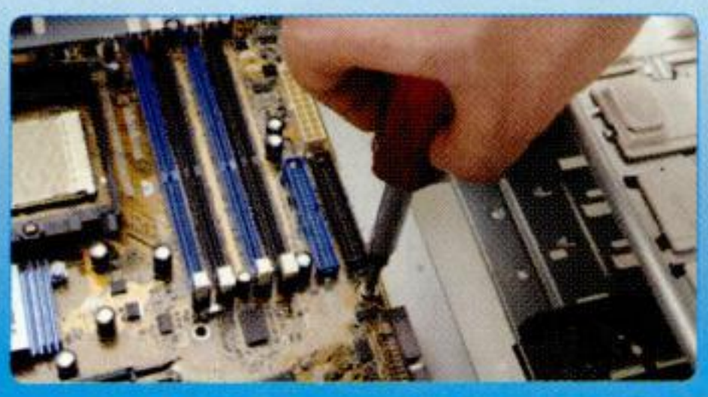

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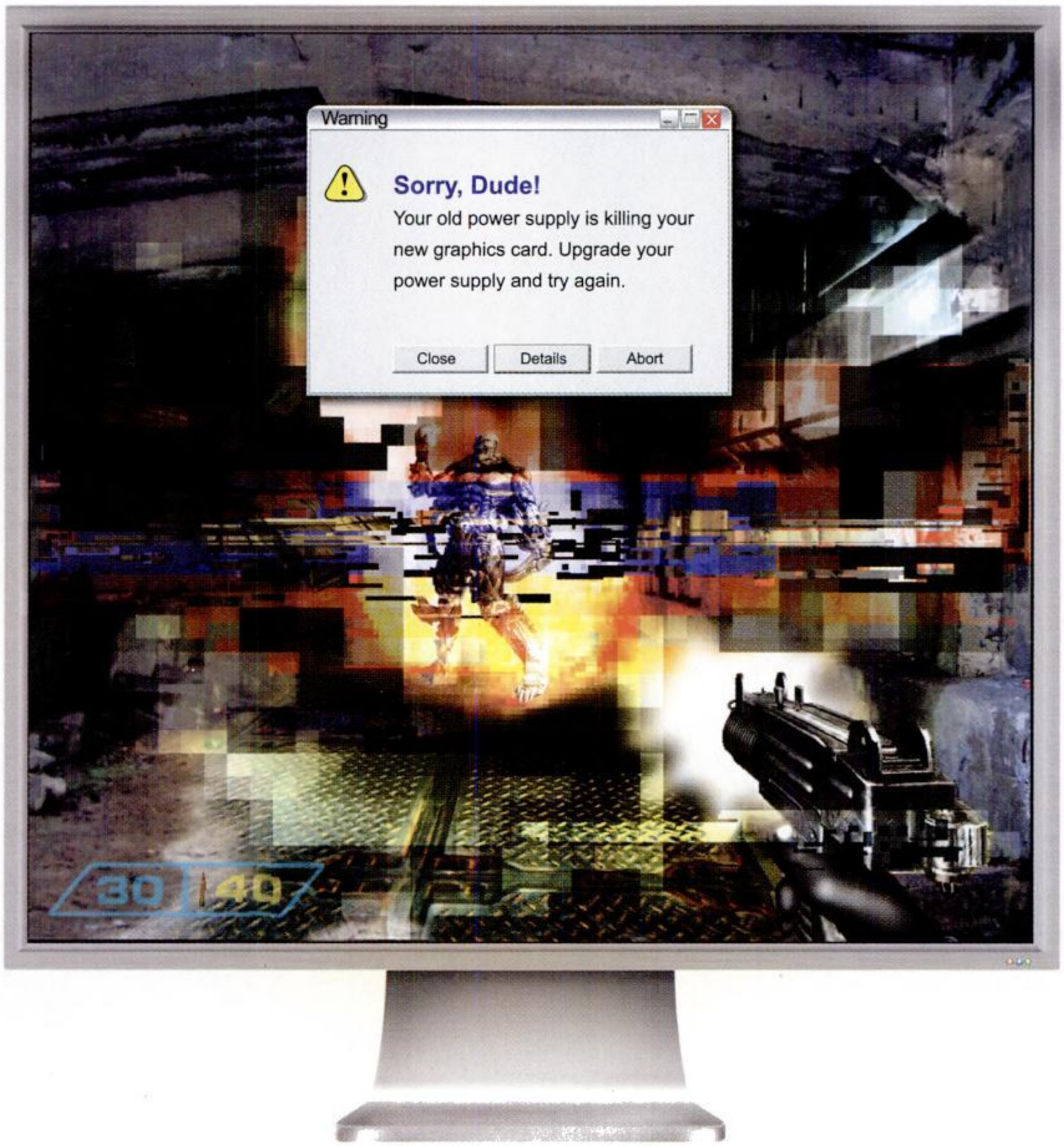

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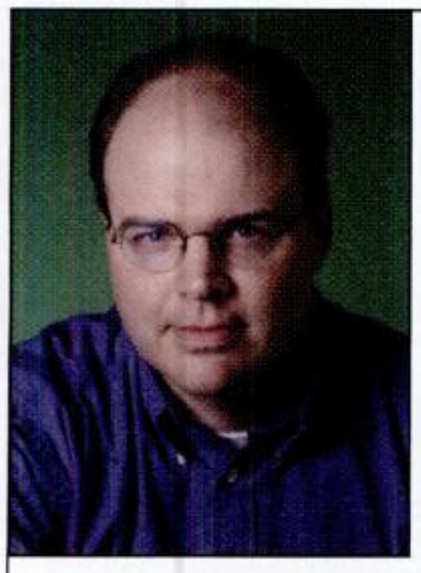

Release Notes

For the Love of the Games

What a difference a year makes. Just 12 short months ago, I was quite impressed with my P4 3.2Ghz-, 1GB RAM-, X800 XT-powered "gaming beast." Smugly confident in my rig's prowess I feared no game. I can still run any new title, but I sometimes find that I have to "dumb-down" the graphics to get an acceptable frame rate. (Gasp!)

The hardware landscape has changed dramatically in the last year—and so has my spot on the gaming-hardware food chain. But such is the circle of life for gamers and our cutting-edge gaming kits, especially when it comes to the sexiest component of them all: the videocard. As soon as you buy one, it seems like something else comes along to eclipse it. As hardcore gamers and PC enthusiasts, we accept this; in fact, we embrace it. Keeping up with the hardware race is part of the fun. We find an almost perverse pleasure in finding new ways to squeeze just a few more horses out of our PCs, all in the name of staying ahead of the latest-and-greatest games.

Incredibly enough, the introduction of several new technologies has further accelerated the pace of change. Dual-core processors and SLI videocards deliver nearly twice the power in the same size box. And on the long-dormant audio front, Intel's HD Audio spec and Creative Labs' new X-Fi soundcard are prepping to go toe-to-toe.

Are these the must-have technologies of today? If so, which vendors have the best solutions? ATI or nVidia; AMD or Intel? Gamers looking to upgrade, buy, or build a new gaming PC today face plenty of questions. You probably fall into this category, or you wouldn't have picked up this magazine. (Thanks, by the way.)

You're looking for answers and sage advice, and that's where we step in. This issue is designed to help you prepare your PC for the next wave of resource-hungry games. Whether you're looking for just a videocard upgrade or a complete system overhaul, you'll find these pages filled with no-BS recommendations. We'll guide you to the most powerful—and future-proof—hardware you can buy.

And why do we subject ourselves to this hardware rat race? For the games, of course! Our obsession with games fuels our passion for the hardware that runs them like butter. To that end, you'll find plenty of gaming goodness to celebrate in this issue. Looking for a good excuse to satiate your need for another hardware-fix? Check out our Coming Attractions on page 86.

Incredible games are headed your way, and they're going to demand new levels of performance from your PC. Arm yourself with the information packed in this special issue and you'll be ready.

— Stephen P. Klett Jr.
sklett@maximumpc.com

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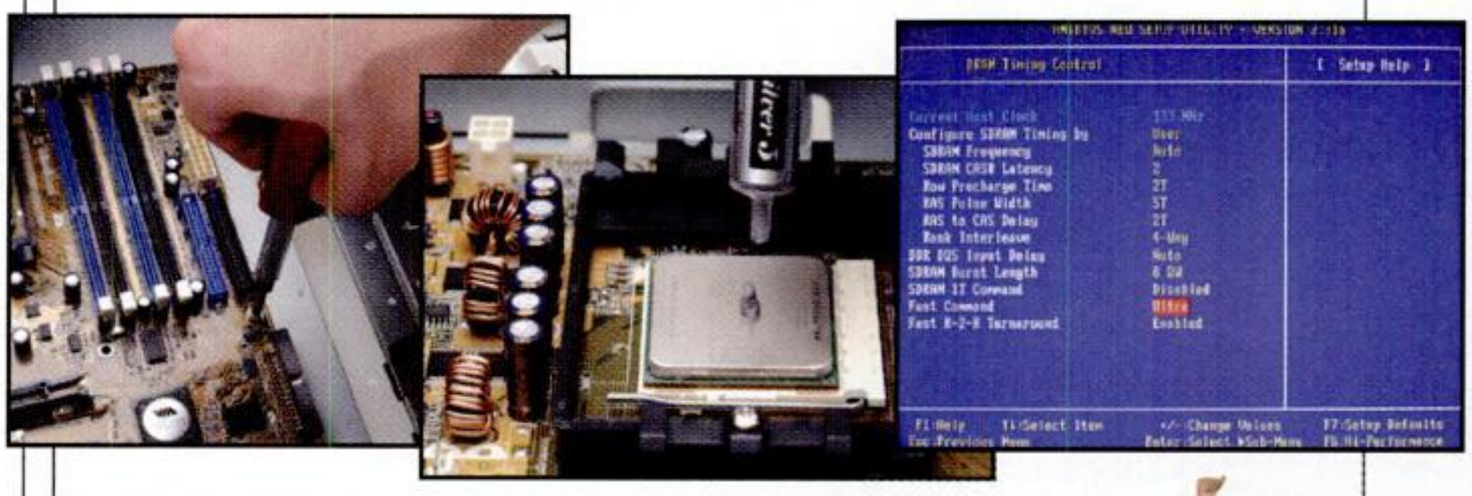

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PC Gaming Hardware

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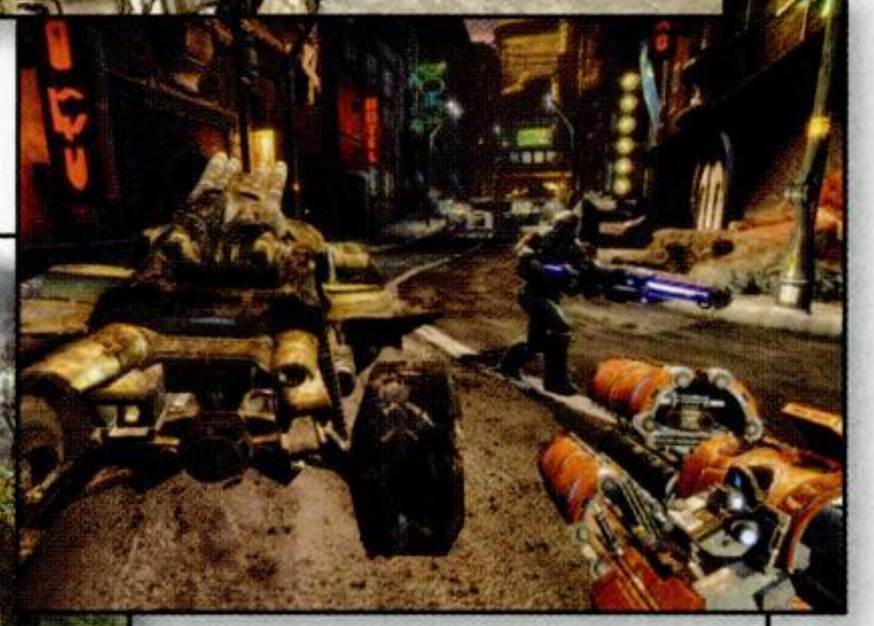

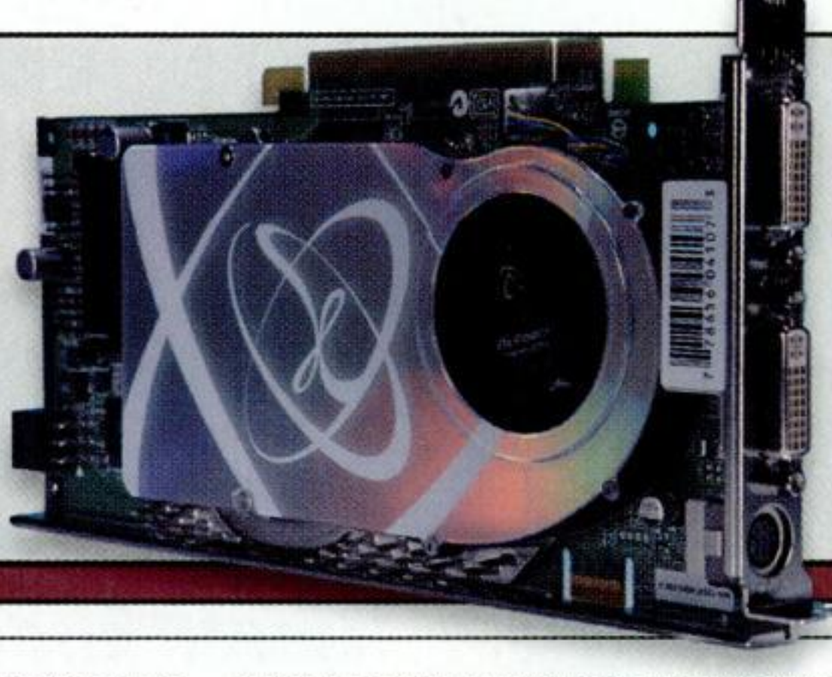

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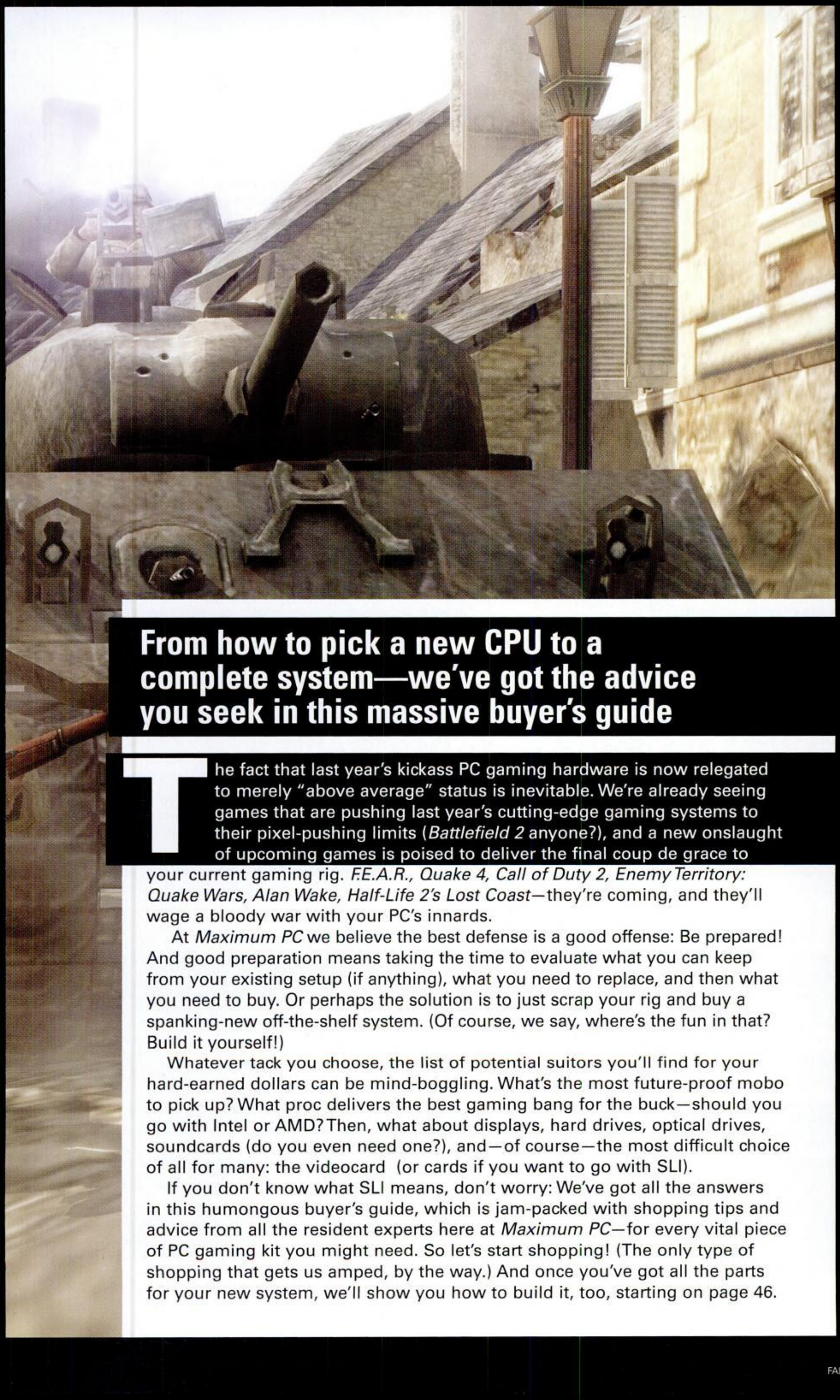

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From how to pick a new CPU to a complete system—we've got the advice you seek in this massive buyer's guide

The fact that last year's kickass PC gaming hardware is now relegated to merely "above average" status is inevitable. We're already seeing games that are pushing last year's cutting-edge gaming systems to their pixel-pushing limits (*Battlefield 2* anyone?), and a new onslaught of upcoming games is poised to deliver the final coup de grace to your current gaming rig. *F.E.A.R., Quake 4, Call of Duty 2, Enemy Territory: Quake Wars, Alan Wake, Half-Life 2's Lost Coast*—they're coming, and they'll wage a bloody war with your PC's innards.

At *Maximum PC* we believe the best defense is a good offense: Be prepared! And good preparation means taking the time to evaluate what you can keep from your existing setup (if anything), what you need to replace, and then what you need to buy. Or perhaps the solution is to just scrap your rig and buy a spanking-new off-the-shelf system. (Of course, we say, where's the fun in that? Build it yourself!)

Whatever tack you choose, the list of potential suitors you'll find for your hard-earned dollars can be mind-boggling. What's the most future-proof mobo to pick up? What proc delivers the best gaming bang for the buck—should you go with Intel or AMD? Then, what about displays, hard drives, optical drives, soundcards (do you even need one?), and—of course—the most difficult choice of all for many: the videocard (or cards if you want to go with SLI).

If you don't know what SLI means, don't worry: We've got all the answers in this humongous buyer's guide, which is jam-packed with shopping tips and advice from all the resident experts here at *Maximum PC*—for every vital piece of PC gaming kit you might need. So let's start shopping! (The only type of shopping that gets us amped, by the way.) And once you've got all the parts for your new system, we'll show you how to build it, too, starting on page 46.

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How to Buy a CPU

Is dual-core good for gaming? Let's find out!

When Intel announced that it had cancelled plans for a 4GHz Pentium 4 last year, it signaled the end of the Megahertz Cold War—a decade-long battle where the only thing that seemed to matter was clock speed. But all is not quiet on the CPU front, as Intel and AMD are now battling for dual-core domination.

What's dual core? It's literally two brains in one central processing unit (CPU). It's basically what people used to get when they bought a dual-processor system, except dual-core chips jam it all into one CPU.

The Price

The dual-core promise is a double-edged sword. They're expensive at $1,000 a pop, and because dual-core processors are larger, they create more heat and use more power than traditional single-core procs. To tame today's dual-cores, both AMD and Intel have to ratchet the speeds down compared to their single-core counterparts.

AMD's highest-clocked (and arguably its fastest) single-core CPU is the Athlon 64 FX-57, which runs at 2.8GHz. AMD's fastest dual-core is 400MHz slower. In Intel land, the fastest dual-core chip runs at 3.2GHz, while its highest-clocked single-core chip hits 3.8GHz.

Dual-core chips also need applications and games to be updated to produce the best performance. In the majority of today's games, for example, the fastest single-core processor will smoke any dual-core CPU. Thus, AMD and Intel are continuing to offer higher-clocked single-core processors specifically for gamers.

The Pay Off

Dual-core CPUs can easily outpace single-core processors in applications that are multi-threaded, such as video-editing or DVD-encoding suites. Dual-core processors also pay really big dividends in multi-tasking, (i.e., running more than one program at the same time). You could, for example, transcode video for a DVD while editing images in Adobe Photoshop or playing a game—without any perceived slowdown, which is something that's not possible with a single-core processor.

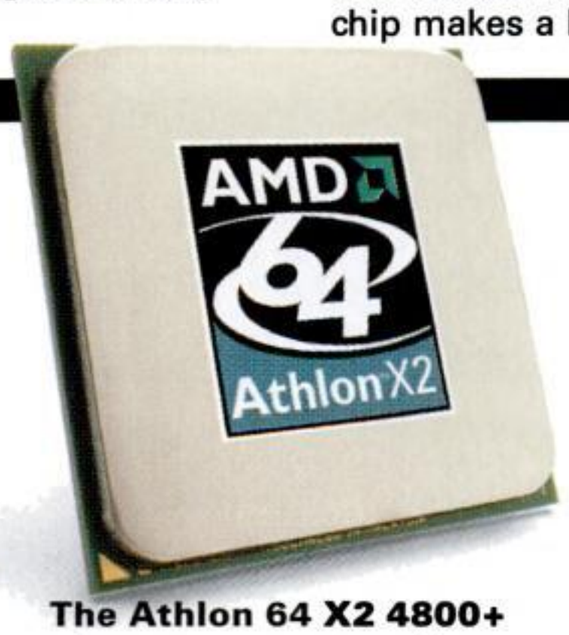
What's Right for You?

Dual-core is the future of computing, but do you need it, now? To determine that, you really have to ask yourself what you use your computer for. If your number-one concern is gaming, then the fastest single-core chip, such as an Athlon 64 FX-57, is your best choice. If you find that you like to multi-task, a dual-core chip makes a hell of a lot more sense.

AMD's Lineup

It's fair to say that AMD has mostly had the upper hand since introducing its Athlon 64 and Athlon 64 FX series of chips in late 2003.

AMD's fleet includes a strong and fairly easy-to-understand series of CPUs: The gaming-oriented Athlon 64 FX, the dual-core Athlon 64 X2, and the mainstream—but still quite fast—Athlon 64 chips. All three incorporate an on-die memory controller inside the CPU. Older AMD CPUs, and all of Intel's chips, use a separate memory controller located on the motherboard. The on-die controller is one of the key reasons AMD's 64-bit chips have been so fast.



The Athlon 64 X2 4800+ gives you great gaming performance and is a good multi-tasking CPU, too!

The fastest X2 is the Athlon 64 X2 4800+, which ticks along at 2.4GHz and features 1MB of L2 cache. While the 2.6GHz Athlon 64 FX-55 and the 2.8GHz FX-57 are faster, the X2 is actually a respectable performer, especially for gaming. That's because in apps or games that don't support multi-threading, the chip turns in performance identical to a 2.4GHz Athlon 64 FX-53, which was top-of-the-line last year.

AMD's Athlon 64 line uses "model numbers" to denote the performance of its CPUs.

Top CPUs at a Glance

Model number	AMD Athlon 64 X2 4800+	AMD Athlon 64 FX-57	Intel Pentium Extreme Edition 840	Intel Pentium 4 Extreme Edition
Frequency	2.4GHz	2.8GHz	3.2GHz	3.73GHz
Microarchitecture	K8	K8	Enhanced Netburst	Enhanced Netburst
Process	90 nanometer	90 nanometer	90 nanometer	90 nanometer
Execution Cores	2	1	2	1
Die size	206mm²	115mm²	199mm²	135mm²
L2 cache	1MB	1MB	1MB	2MB
Transistor count	230 million	114 million	233 million	169 million
Interface	Socket 939	Socket 939	LGA775	LGA775
Front Side Bus	N/A	N/A	800MHz	1066MHz
Features	SSE, SSE2, SSE3, 3DNow!, 3DNow Pro!, AMD64	SSE, SSE2, SSE3, 3DNow!, 3DNow Pro!, AMD64	SSE, SSE2, SSE3, AMD64, Hyper-Threading	SSE, SSE2, SSE3, AMD64, Hyper-Threading
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AMD says the model numbers are based on benchmarks but we say it's really a "wink, wink, nod, nod" shot at Intel. The Athlon 64 3000+ is really a sly way to communicate to consumers that the chip performs on par with an Intel Pentium 4 clocked at 3GHz. Regardless, AMD has been very honest with its model numbers and the performance the chips yield. The current lineup goes from the 1.8GHz A64 3000+ with 512KB of L2 cache to the 2.4GHz A64 4000+ with 1MB of L2 cache.

AMD's approach to computing is multi-pronged: its X2 dual-cores will slowly supplant the single-core Athlon 64's during the next couple of years while the FX will continue to push the limits of single-core power. Again, the fastest chip in AMD's stable today is the 2.8GHz Athlon 64 FX-57. For gaming, you will find nothing faster. And because games won't take advantage of dual-cores for at least 12 months, AMD will continue to push the speeds of the FX line, so you can probably expect a 3GHz FX-59 next year.

Intel's Crew

When Intel admitted that it couldn't rely on clock speed increases alone to keep up with AMD in performance, it turned to dual core.

This year, the company has gone into overtime to dazzle the world with new dual-core processors, and it even showed off working samples of its next-generation CPUs a year before they're slated for release.

Unlike AMD's easy-to-understand lineup, Intel's offerings are numerous and confusing. On the top end, it has the 3.73GHz Pentium 4 Extreme Edition, which features 2MB of L2 cache and operates on a 1,066MHz front-side bus, a jump from the 800MHz front-side bus of all other Intel Pentium 4 chips. (The front-side bus spec represents the speed at which a CPU talks to the rest of the computer, and faster is generally better.)

In the dual-core area, Intel's offerings are differentiated by a single feature:

The Pentium D offers the best multi-tasking performance bang for the buck.

Hyper-Threading. Hyper-Threading is a technology that splits a single processor's resources into two virtual processors. It's not as good as a real dual-core, but it does help when running multiple applications. The dual-core Pentium D 840 runs at 3.2GHz and has 1MB of L2 cache per core, but it doesn't have Hyper-Threading. The Pentium Extreme Edition 840 is the same CPU but with Hyper-Threading turned on.

Naturally, the addition of HT comes with a price hike—is it worth it? Not quite yet. Our own tests show that under some circumstances, HT can actually hurt performance with Windows XP. The problem may lie with the OS, but for now, we recommend sticking with the Pentium D.

In the CPUs-for-the-rest-of-the-world category, Intel's chips are truly confusing. The simple solution is to only buy chips that use the new 6XX-series designation instead of the 5X0-series. You would want to buy, for example, a Pentium 4 670, which runs at 3.8GHz and has 2MB of L2 cache and supports 64-bit operating systems, instead of the older Pentium 4 570. The older 570 also runs at 3.8GHz, but its cache is half that of the 670, and it doesn't support 64-bit OSes. To make the prune juice even muddier, Intel recently introduced a set of 5X1 chips. The Pentium 4 571, for example, runs at 3.8GHz and has half the cache of the 670, but does 64-bit OSes. Oy!

AMD Buying Tips

Building or buying an AMD system is easy today. There are two options: Socket 754, which is increasingly being relegated to ultra-budget systems, and Socket 939. Buy a system with Socket 939 support and you can run everything from a lowly Athlon 64 3000+ to an Athlon 64 X2 4800+ or Athlon 64 FX-57. The only truly confusing portion of AMD's lineup is in the budget Sempron line. Earlier Socket 754 Semprons did not support 64-bit (duh), but AMD recently minted an entire lineup of S754 Sempron's that support 64-bit. The problem is that you can't tell the difference without digging into the esoteric OPN numbers. (Double duh.)

Intel Buying Tips

It's not really clear where 64-bit OS support is going but we think it would be silly to buy a chip without it at this point. To do that, you'll need to buy a 600-series processor or one with a "1" in the model number such as the Pentium 4 571 or Pentium 4 561. All of the company's dual-core procs, and the 3.73GHz P4 Extreme, support 64-bit. Finally, if you're hot to trot for an Intel dual-core CPU, we say hold off on forking over the extra dough for Hyper-Threading support in the Pentium Extreme Edition and go with a Pentium D chip.

How to Pick a Mobo

The Motherboard has become the most important choice you'll make when building or buying a new PC

Your Mama is an important part of who you are and what you've become. That same maternal significance applies to your PC's motherboard. Buy the wrong motherboard and your CPU choices could be stunted, your hard-drive options limited—and your future bleak.

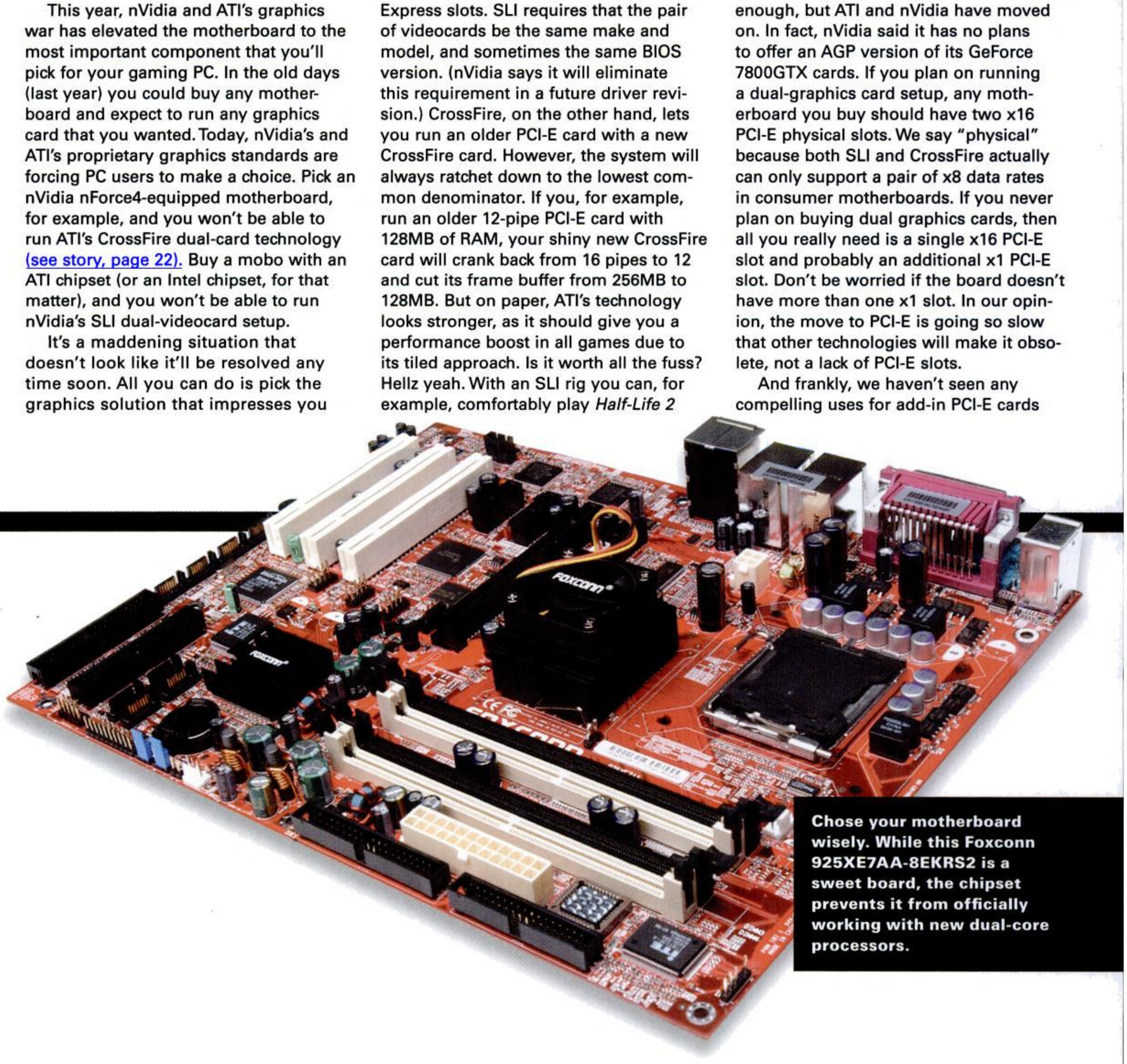
This year, nVidia and ATI's graphics war has elevated the motherboard to the most important component that you'll pick for your gaming PC. In the old days (last year) you could buy any motherboard and expect to run any graphics card that you wanted. Today, nVidia's and ATI's proprietary graphics standards are forcing PC users to make a choice. Pick an nVidia nForce4-equipped motherboard, for example, and you won't be able to run ATI's CrossFire dual-card technology (see story, page 22). Buy a mobo with an ATI chipset (or an Intel chipset, for that matter), and you won't be able to run nVidia's SLI dual-videocard setup.

It's a maddening situation that doesn't look like it'll be resolved any time soon. All you can do is pick the graphics solution that impresses you the most and buy the motherboard/chipset combo that supports it.

SLI and CrossFire. If you want to build the ultimate gaming PC, you'll have to have dual graphics cards. nVidia's SLI, or Scalable Link Interface, requires an SLI-ready motherboard with two x16 PCI Express slots. SLI requires that the pair of videocards be the same make and model, and sometimes the same BIOS version. (nVidia says it will eliminate this requirement in a future driver revision.) CrossFire, on the other hand, lets you run an older PCI-E card with a new CrossFire card. However, the system will always ratchet down to the lowest common denominator. If you, for example, run an older 12-pipe PCI-E card with 128MB of RAM, your shiny new CrossFire card will crank back from 16 pipes to 12 and cut its frame buffer from 256MB to 128MB. But on paper, ATI's technology looks stronger, as it should give you a performance boost in all games due to its tiled approach. Is it worth all the fuss? Hellz yeah. With an SLI rig you can, for example, comfortably play *Half-Life 2* at 100fps with 4x AA and 8x anisotropic filtering at 1600x1200. For more info on SLI, read our videocard story, which starts on page 20.

PCI Express. PCI-E has all but supplanted AGP when it comes to new machines. You'll hear grousing that AGP is still good enough, but ATI and nVidia have moved on. In fact, nVidia said it has no plans to offer an AGP version of its GeForce 7800GTX cards. If you plan on running a dual-graphics card setup, any motherboard you buy should have two x16 PCI-E physical slots. We say "physical" because both SLI and CrossFire actually can only support a pair of x8 data rates in consumer motherboards. If you never plan on buying dual graphics cards, then all you really need is a single x16 PCI-E slot and probably an additional x1 PCI-E slot. Don't be worried if the board doesn't have more than one x1 slot. In our opinion, the move to PCI-E is going so slow that other technologies will make it obsolete, not a lack of PCI-E slots.

And frankly, we haven't seen any compelling uses for add-in PCI-E cards



Chose your motherboard wisely. While this Foxconn 925XE7AA-8EKRS2 is a sweet board, the chipset prevents it from officially working with new dual-core processors.

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besides graphics, and hardware vendors are telling us that x1 is just too slow to be useful today because of latency issues. Sure, an x1 PCI-E slot offers more than double the data rates of an old PCI slot. However, with most vendors saying that it'll take x4 PCI-E before we see worthwhile performance improvements, we say don't worry if the mobo doesn't have more than one x1 PCI-E slot.

Integrated Audio. The No. 1 competitor to Creative Labs' popular Sound Blaster cards isn't even a card. It's onboard audio. Once thought of with extreme disdain, onboard audio has become rather respectable. Intel's HD Audio spec for Pentium 4 motherboards has even pushed onboard audio to 24-bit capabilities with the ability to use the CPU to take the surround-sound audio and convert it for use with a living room Dolby Digital deck—in real time (see story, page 33).

So is onboard audio the end of soundcards? We say no. Even though HD Audio specs 24-bit components, the fact that they're mounted on a motherboard—the equivalent of an electrical noise storm—means onboard audio still isn't better than an add-in soundcard. However, all but the most astute listeners will not perceive a difference in audio quality between onboard and add-in audio.

We like the HD Audio spec and think it's valuable to have. One warning, though: not all motherboard vendors support the Dolby Digital Live portion, which is what you'll need to use your PC with a living-room surround-sound speaker system. If you intend to build a PC for your living room, you'll want to make sure you choose a motherboard with Dolby Digital Live support. Of course, that applies only to Intel-based motherboards. The majority of Athlon 64 motherboards still use 16-bit parts, and nVidia has even told us there was no demand for higher-resolution components so it didn't add the support to its latest chipsets. For Athlon 64 boards, we recommend a good sound card.

SATA 3Gb/s. When you build a city, you don't wait for massive traffic jams before you build roads—you expand the roads before the gridlock occurs. SATA 3Gb/s does that by doubling the data rates of the original SATA hard-drive spec to 300MB/s. SATA 3Gb/s also adds a host of other advanced features such as native command queuing (NCQ), which intelligently reorders data as it is read from the hard drive for higher performance; and port-multiplying technology, which lets you tack on more SATA ports. For the most part, SATA 3Gb/s is a technology that doesn't help gaming because today's hard drives aren't fast enough. And NCQ really only benefits highly randomized reads from the hard drive, such as server applications. However, since there's no real additional cost for SATA 3Gb/s (the latest Intel and AMD chipsets support it), it doesn't make sense to not get it.

Front-Side Bus. The speed of the mobo's front-side bus really only matters with Intel processors because AMD chips integrate the memory controller in the CPU. For Intel, we think the minimum speed a new mobo should support is 1,066MHz. There's currently only one production processor that supports it: the 3.73GHz P4 Extreme Edition. However, we suspect that Intel plans to offer more chips that support the faster front-side bus spec. So, it's just plain smart to get a board that supports it.

Dual-Core Support. If you're shopping for an AMD board, all you need to know about any potential motherboard is whether it has the ability to run an Athlon 64 FX-55 CPU. If it does, you can run dual-core. Done. Fini. Over. For Intel, it's a little more complicated... The 925XE chipset that Intel introduced early this year cannot, for example, support dual-core. Only motherboards using the 945 and 955X series are fully qualified to run all of Intel's dual-core procs. Ahh, but what about nVidia's new nForce4 SLI Intel Edition: Can't that run dual-core? Yeah, sorta. Only nForce4 SLI Intel Edition boards certified by the individual motherboard vendors can run some dual-core procs. For some odd reason, which we suspect is related to the intense rivalry between Intel and nVidia, the NF4 will not support the 2.8GHz Pentium D 820 processor. The whole situation just stinks. The key when selecting a dual-core board on the Intel side is to be very picky about what you want and to plan ahead. For more on dual-core procs, see page 12.

The Chipset. The core-logic chipset is the brains of any motherboard and is the most important component on the motherboard. It'll dictate whether you can run dual-core (see above) and SLI, and what level of SATA drives you can run. It also has a huge impact on the performance of the motherboard. For space reasons, we can't expound on the intricacies of every chipset, but here's what we recommend: nForce4 SLI or nForce4 Ultra for AMD applications and Intel's 955X or nForce4 SLI Intel Edition chipsets.

BTX. Intel's push for the Balanced Technology eXtended specification is the first overhaul of desktop form factors since the nearly decade-old ATX spec debuted. It dictates a number of changes that make sense for today's—and tomorrow's—faster PCs, such as relocating the CPU to the front of the motherboard so a single fan can suck fresh, cool air in the front of a case and blow it over the processor, video card, and chipset. It also moves the southbridge chip—which controls the hard drive, DVD drives, and USB ports—closer to the rear of the PC, where most of the high-speed I/O is going on these days. In short, BTX will let companies build cooler, quieter, and faster PCs. It's also pretty meaningless today because it's only being used by large PC vendors. Motherboard and case manufacturers are taking a pass for now because they don't see any need to convert. It'll take at least another 12 to 36 months for BTX to go anywhere, and in the meantime, ATX will continue to thrive. So, when buying your motherboard, don't make BTX a "must have."

What About RAM?

RAM decisions have been relatively simple to make for a while now, but the technology will soon be coming to a cross-roads. DDR2 memory, the sequel to the current DDR spec, has been slowly building momentum since its introduction last year. Early samples running at 400MHz and 533MHz didn't rock anybody's world—there was little perceptible performance gain over standard DDR. However, the latest 667MHz and 800MHz versions are starting to turn some heads. Right now, AMD's camp doesn't have to worry about it because Athlon 64 chips are incompatible with DDR2 due to the on-die memory controller. Since DDR2 hasn't really offered much of a performance increase yet, we'd say it's not really worth worrying 'bout. For Intel users, it's also a foregone conclusion because the best gaming motherboards on the market are DDR2-only. DDR on the Intel platform has been mostly relegated to the budget crowd. So, if you're building AMD, don't worry about DDR2. If you're building an Intel box, make sure your motherboard supports, at a minimum, the DDR2/667 speed. And make sure you have at least 1GB of RAM in your gaming rig, preferably 2GB — we're starting to see games, such as *Battlefield 2*, which will benefit greatly from the extra "room."

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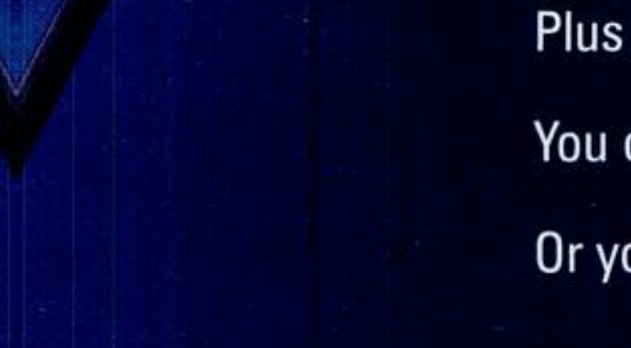

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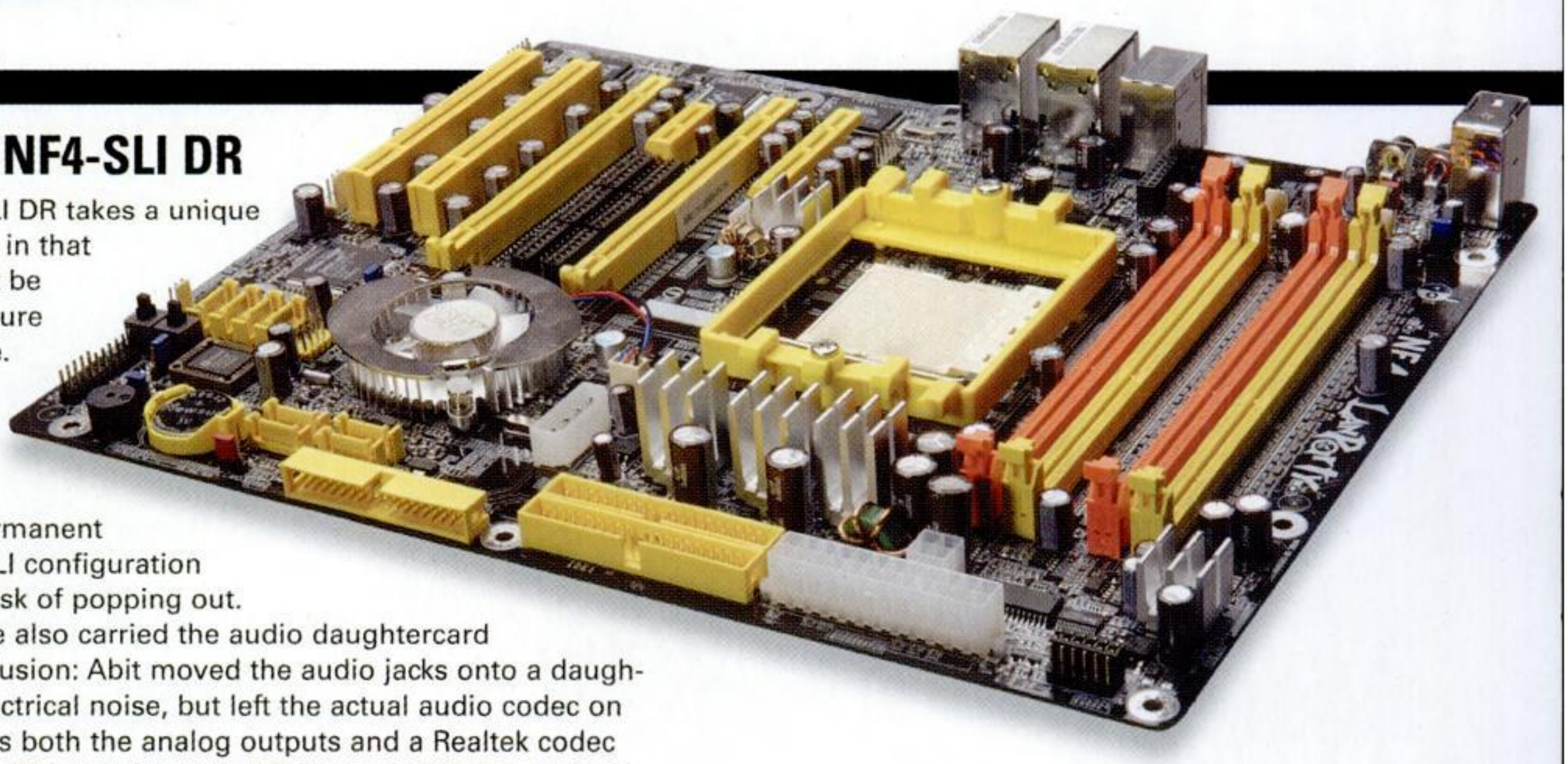
DFI LAN Party NF4-SLI DR



DFI's LAN Party NF4-SLI DR takes a unique tack among SLI boards in that six jumper blocks must be plucked out to reconfigure the board for SLI mode. This design allows you to configure the PCI-E slots in a more flexible manner. And the contact is more permanent than with the typical SLI configuration cards, which seem at risk of popping out.

DFI's engineers have also carried the audio daughtercard idea to its logical conclusion: Abit moved the audio jacks onto a daughtercard to eliminate electrical noise, but left the actual audio codec on the board. DFI packages both the analog outputs and a Realtek codec onto the separate card. (Though we wish DFI had used 24-bit—instead of 16-bit—codecs.)

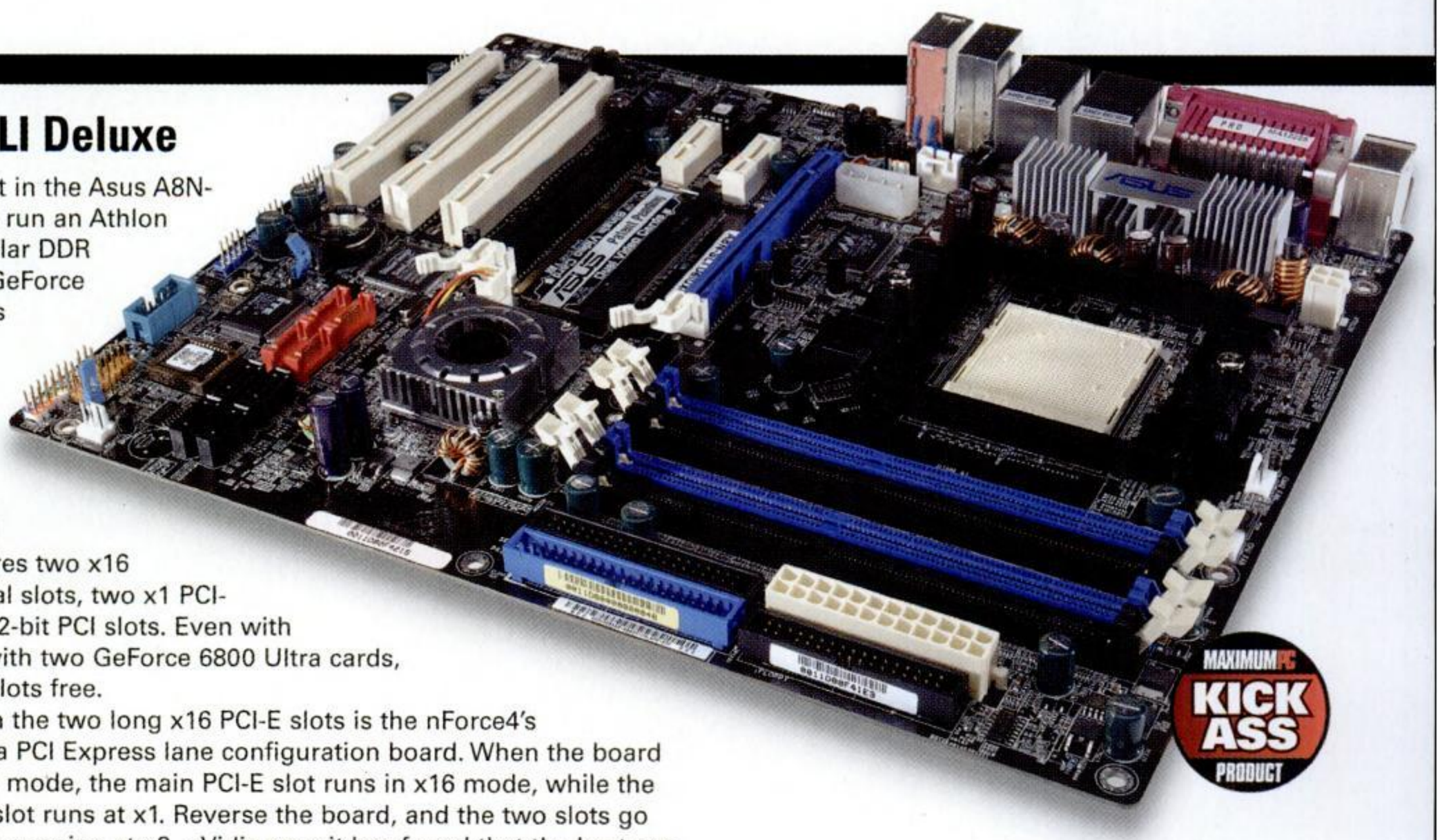
If you're into bling, you'll appreciate the healthy dose of lights, including a bank of LEDs that light up to signal where your board is "stuck" if it doesn't POST correctly. DFI also did a fair amount of BIOS tinkering, adding a feature that enables you to create profiles that can be accessed at boot.

DFI LAN Party NF4-SLI DR

MAXIMUM PC VERDICT 9

$220 (Street), www.dfiweb.com

Asus A8N-SLI Deluxe



The nForce4 chipset in the Asus A8N-SLI Deluxe lets you run an Athlon 64 FX-55 CPU, regular DDR memory, and *two* GeForce 6800 Ultra cards (as well as any other nVidia videocards that support SLI). And it delivers the goods—ultra-high-res gaming with AA turned on!

The board features two x16 PCI Express physical slots, two x1 PCI-E slots, and three 32-bit PCI slots. Even with the board packed with two GeForce 6800 Ultra cards, you still have two slots free.

Located between the two long x16 PCI-E slots is the nForce4's magic ingredient—a PCI Express lane configuration board. When the board is set in single-card mode, the main PCI-E slot runs in x16 mode, while the second long PCI-E slot runs at x1. Reverse the board, and the two slots go into SLI mode, each running at x8. nVidia says it has found that the best performance comes from running both videocards balanced at x8.

The A8N-SLI gives you a bevy of storage options. Between onboard chipset support for four SATA 3Gb/s drives (which support a unique form of RAID that can combine PATA and SATA drives) and a separate Silicon Image 3114 controller with four SATA ports, there's no shortage of places to plug in drives. We also like the inclusion of two PATA ports, as a lot of newer PCI-E boards are cutting back to only one.

Asus A8N-SLI Deluxe

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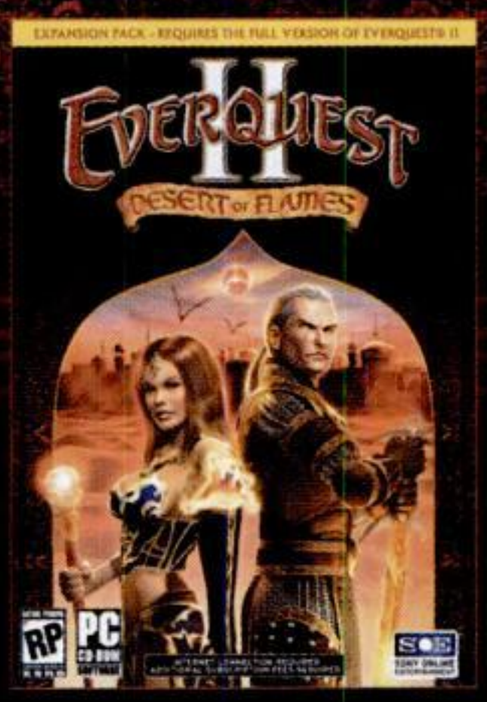

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How to Pick a Videocard

Prepare yourself for the future of SLI

Millions of vertices per second? Fill rates of *billions* of pixels per second? Don't fall victim to a specifications snow job. We'll show you which videocard features and statistics *really* matter.

GPU: The acronym stands for "graphics processing unit," which is the integrated circuit responsible for handling 2D and 3D graphics, as well as video. It is the single most important component on any videocard. When it comes to PC games (and videogame consoles, too, for that matter), two manufacturers have pretty much divided the market between themselves: ATI and nVidia (see page 21 for a comparison of these two companies).

BUS INTERFACE: Your motherboard's expansion bus will have one of two types of videocard slots: AGP or PCI Express. AGP (Accelerated Graphics Port) is the older and slower of the two standards (AGP 8x offers maximum bandwidth of 2.1GB/sec, compared to 8GB/sec for a 16-lane PCI Express), and it looks as though ATI and nVidia don't plan to support AGP with their newest parts. What's more, neither manufacturer's dual-GPU technologies support AGP. But if you're not ready to upgrade your motherboard, you'll need to buy an AGP videocard.

If your motherboard does have PCI Express slots, you absolutely should buy a videocard with a PCI Express interface. PCI Express is a bi-directional serial protocol that's much faster than AGP. Each device on the PCI Express bus has its own dedicated "highway," and each of these highways can be 1, 2, 4, 8, 16, or 32 lanes wide. Although current motherboards support only 16 PCI Express lanes for graphics, the bandwidth available in such a configuration is roughly double that from an AGP slot.

PIXEL PIPELINES: GPUs create images by processing pixels in parallel pipelines. The more pixel pipelines a GPU has, the faster it will be capable of rendering an image. Everything else being equal, a GPU with 24 pixel pipelines will be faster and more powerful than one with 16 pipes; a 16-pipe GPU will be faster and more powerful than a 12-pipe GPU; and so on.

CORE CLOCK SPEED: In a discussion of videocards, the word "core" refers to the videocard's GPU. Core clock speed measures how fast the GPU is set to operate and is stated in megahertz (MHz), or millions of cycles per second. Generally speaking, a faster core clock speed will translate to faster performance within a given GPU series. Comparing Radeon-series clock speeds to GeForce-series clock speeds, on the other hand, is not necessarily a reliable measure of performance.

You'll need a card with hardware support for Pixel Shader Model 3.0 — such as nVidia's new 7800 GTX — to get at all of the high-dynamic range bells and whistles in *Half-Life 2's Lost Coast*.

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MEMORY: Videocards can be equipped with different types of memory in different quantities. The amount of memory on the videocard helps determine the maximum resolution the card is capable of displaying. Budget videocards are generally equipped with 128MB of memory, but 256MB is the sweet spot. A few manufacturers are offering higher-end boards with 512MB, but at press time, every product based on nVidia's ultra-high-end GeForce 7800 GTX GPU was being equipped with only 256MB.

MEMORY CLOCK SPEED: This specification measures how fast the videocard's memory is set to operate and is stated in megahertz (MHz) or millions of cycles per second. This spec can be confusing because some videocard manufacturers publish clock-speed specs while others promote "effective" clock speeds (even though they don't always label their spec that way). Allow us to explain: Nearly all videocards are outfitted with some flavor of DDR RAM (DDR is an acronym for "double data rate"). DDR memory is capable of transferring data on both the rising and falling edges of the clock signal; DDR RAM clocked at 500MHz, therefore, has an effective clock speed of 1GHz.

DDR2 RAM and DDR3 RAM operate on this same principle, but these types of memory are capable of higher clock speeds. GDDR3 RAM, meanwhile, is a double-data-rate memory designed specifically for videocard applications. It requires less power and generates less heat than DDR RAM.

MEMORY INTERFACE: The wider the connection between the videocard's GPU and its memory, the faster the GPU can process data. Budget videocards typically have a 128-bit interface to memory, while higher-end cards usually have a 256-bit interface.

DISPLAY INTERFACE: Videocards have up to three types of connectors for connecting a display: DVI, VGA, or TV-Out. DVI (the acronym stands for Digital Visual Interface) is an Intel-developed standard for connecting a digital display, such as an LCD. VGA (the acronym ostensibly stands for Video Graphics Array, but the term is now widely used to describe any analog computer video signal or connector) connects an analog computer display. TV-Out, as its name implies, outputs an analog video signal compatible with consumer televisions, VCRs, and the like.

Most videocards have at least one DVI port and one analog VGA port. High-end cards offer dual DVI ports, so you can run two flat-panel displays in digital mode, but you can connect either type of computer display to either connector using an adapter. Cards that support TV-Out usually provide a breakout cable with connectors for composite, S-Video, and—in some cases—component video.

VIVO: The acronym stands for video-in/video-out, and it describes a port on the videocard that can both accept and produce a TV-compatible analog video signal. Videocards with VIVO ports can digitize analog video in real time, which makes them suitable for nonlinear video editing.

DIRECT-X: This is a collection of APIs (application program interfaces) developed by Microsoft to simplify game development and eliminate hardware/software compatibility issues with the company's Windows operating system. As of this writing, DirectX 9.0c was the most current version. DirectX support is ubiquitous in games, but make sure the card you're considering supports the latest version.

SHADER MODEL 3.0: This is a composite label for two components of Microsoft's DirectX technology: Pixel Shader Model 3.0 and Vertex Shader Model 3.0, which enable game developers to create more complex and realistic environments while simultaneously reducing CPU and memory overhead.

The limited numbers of games that currently utilize Shader Model 3.0 will revert to an earlier shader model when run on a GPU that doesn't support the new standard. nVidia's GeForce 6- and 7-series GPUs support Shader Model 3.0 now. ATI's upcoming new GPU—codenamed R520—is expected to support the technology when it comes to market later this year.

ATI vs. NVIDIA

ATI and nVidia are both fabless semiconductor companies. That means they design and sell semiconductors, but they rely on contract manufacturing facilities for actual production. The advantage for both companies is that they don't have to make tremendous investments in fabrication equipment and facilities—they can focus on research and development and marketing instead.

Although Intel sells far more graphics processors than both ATI and nVidia (because it sells a ton of motherboards with onboard graphics), the latter two companies are the market's twin 800-pound gorillas when it comes to high-end consumer GPUs. ATI and nVidia have waged a battle for supremacy for several years, with each company leapfrogging the other with each new generation of processor.

Consumers have benefited tremendously from this competition, since it has driven videocard performance higher while prices have headed lower—especially when an entirely new generation of GPUs reaches the market.

In late 2004, nVidia clawed its way to the top of the performance heap by introducing SLI: Two of the company's previous top-of-the-line GeForce 6800 Ultras working in parallel will eat ATI's top-of-the-line GPU, the Radeon X850 Platinum Edition, for breakfast. ATI has announced a dual-GPU solution, but hasn't shipped anything yet.

ATI got more bad news in June 2005. The day after ATI informed its investors of a quarterly loss and warned that its annual results would be lower than expected—due, in part, to a delay in shipping *its* next high-end part, codenamed the R520—nVidia announced that it was already shipping *its* next top-of-the-line GPU, the GeForce 7800 GTX, to its customers.

ATI and nVidia also compete with Intel when it comes to manufacturing core-logic chipsets, and both companies seem intent on locking consumers into motherboards with their own chipsets in order to install their dual-GPU videocard solutions. Just as nVidia's SLI technology requires that your motherboard be equipped with nVidia's nForce4 chipset, so must your motherboard be outfitted with a Radeon Xpress 200 chipset if you plan to make use of ATI's CrossFire. If you have no intention of installing dual videocards in your PC, it doesn't really matter which chipset is on your motherboard—either GPU will function.

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Double Your Fun With Dual GPUs

nVidia scored something of a coup against arch-rival ATI by introducing technology that enables two of its GPUs to operate in a single PC, dividing the graphics-processing workload and compositing their output to a single display. nVidia calls it SLI (Scalable Link Interface). Less than a year later, ATI responded by announcing a dual-GPU strategy of its own, which its dubbed CrossFire. Let's take a look at both technologies.

nVidia's SLI requires a motherboard with PCI Express slots and nVidia nForce4 core logic, two matching GeForce or Quadro FX videocards, and a proprietary card that bridges the two cards inside the case. And when nVidia says "matching," they mean that if you have a GeForce 6600GT with 128MB of memory, your second card must *also* be a GeForce 6600GT with 128MB of memory. What's more, both cards must be from the same manufacturer (nVidia plans to eventually ditch this requirement through a driver update).

nVidia claims SLI delivers "graphics performance up to 2x," but it falls a little short of that mark in most real-world benchmarks. You should also be aware that two videocards connected via SLI maintain separate framebuffers. A pair of 128MB videocards in SLI, therefore, don't combine to form a 256MB framebuffer (the same is true for CrossFire). But don't get us wrong — these dual-GPU solutions aren't bogus: they're proven to significantly boost your PC's performance.

ATI CROSSFIRE

Although we've received an extensive briefing on ATI's CrossFire, ATI hadn't shipped evaluation units as of press time. Here's what we know so far: As with SLI, CrossFire will require support from the motherboard's core logic, so the first step in assembling a CrossFire system will be to purchase a "CrossFire-ready" motherboard. The next step will be to purchase a CrossFire Edition graphics card to be paired with one of ATI's Radeon-series graphics cards.

Unlike nVidia's SLI, ATI's cards connect via a three-headed DVI cable outside the case: The "regular" Radeon card sends its output over this cable to the CrossFire Edition card, which composites this with its own rendering and outputs the combined signal to your display through a third DVI connector.

Also unlike nVidia's solution, ATI's solution will enable you to mix and match a variety of Radeon-series cards—within limits. The 256MB Radeon X800 CrossFire Edition card, for example, will be compatible with any flavor of Radeon X800. But if you connect it to a 128MB Radeon X800, you'll end up with two 128MB framebuffers. This parity requirement also applies to pixel pipelines: All CrossFire Edition cards will have 16 pixel pipelines, but if you connect one to a 12-pipe X800 Pro, four of the CrossFire's pipelines will shut down.

BUDGET VIDEOCARD

Leadtek WinFast PX6600 GT TDH Extreme

The GeForce 6600 GT on Leadtek's WinFast PX6600 GT TDH Extreme is clocked at 560MHz, and the 128MB memory is cranked up to 550MHz. nVidia's reference design clocks both GPU and RAM at 500MHz. Apart from the clock settings, however, Leadtek's board design is pretty generic.

Despite the fact that the PX6600 uses just a 128-bit memory interface and has only eight pixel pipelines, the GPU performs well at this clock speed. Even better, you can operate a pair of cards in SLI mode.

There's nothing exciting about this card's benchmark numbers at high resolutions with all the visual goodies enabled, but the PX6600 is a good value for people faced with a strict $200 budget.

Leadtek WinFast PX6600 GT TDH Extreme

MAXIMUM PC VERDICT 6

$200, www.leadtek.com

MID-RANGE VIDEOCARD

ATI Radeon X800 XL

ATI's X800 XL boasts 256MB of GDDR3 memory with a 256-bit interface and 16 pixel pipelines. GPU and memory clock speeds are less impressive: 398MHz and 493MHz, respectively.

The X800 XL is a single-slot card with a relatively quiet fan, and when ATI gets its CrossFire solution together, you'll be able to run two of these boards in a single PC (you'll need a new motherboard with an ATI chipset).

In our tests, the X800 XL delivered an impressive 60fps in *Far Cry* at 1600x1200 with 4x antialiasing and 8x anisotropic filtering. The card was sluggish playing *Doom 3* at those settings, but we were satisfied with 59.5fps at 1024x768 with 4x AA.

ATI X800 XL

MAXIMUM PC VERDICT 8

$300, www.ati.com

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ATI Radeon X850 XT Platinum Edition

The X850 XT Platinum Edition marks ATI's last gasp with its current GPU architecture—we won't see anything faster from the Great White North until the company ships its much-delayed R520.

The X850 PE is just a hair faster than nVidia's previous top-end chip, the GeForce 6800 Ultra, but ATI cranked up the clock speed so high (608MHz) that the board requires a two-slot cooling solution. Memory, on the other hand, is actually slower (520MHz) than ATI's previous top-end board, the X800 Platinum Edition.

If you're still holding on to an archaic NV30- or R300-powered board and can't afford nVidia's $600 GeForce 7800 GTX, this board is a good compromise—as long as you don't mind the dual-slot configuration.

ATI Radeon X850 XT Platinum Edition

MAXIMUM PC VERDICT 8

$500, www.ati.com

eVGA e-GeForce 6800 Ultra

The key to the eVGA's power is the NV40 core running at 400MHz, paired with 256MB of GDDR3 SDRAM running at 550MHz. This GPU purred through all of our benchmarks with nary a problem.

The GeForce 6800 Ultra is a hot and power-hungry part, however, and this dictates that the board be equipped with a two-slot cooler—just like ATI's X850 XT P.E. Unlike ATI's board, however, you can run two PCI-Express cards in SLI for a significant boost in performance (this will change when ATI ships its CrossFire solution).

If you can squeeze an extra $100 out of your budget, you'll want a videocard based on nVidia's brand-new GeForce 7800 GTX. If you can't swing that, this is a great solution.

MAXIMUM PC KICK ASS PRODUCT

eVGA e-GeForce 6800 Ultra

MAXIMUM PC VERDICT 9

$500 www.evga.com

XFX GeForce 7800 GTX

If you want the absolute fastest videocard and money is no object, you want a board—or two—powered by nVidia's GeForce 7800 GTX.

XFX managed to push the 7800 beyond nVidia's reference design by clocking this board's graphics core at 450MHz and its memory at 625MHz (reference design is 430MHz and 600MHz, respectively). Despite the high clocks, the board uses a single-slot cooler. But the 7800 GTX is the real star of this show. With 302 million transistors and 24 pixel pipelines, this card chewed through our benchmarks like a beaver through birch.

The downside is the price tag: A single card costs $600; double that for a SLI. Is it worth it? Well, we didn't let the high price stop us from rating it Kick Ass.

MAXIMUM PC KICK ASS PRODUCT

XFX GeForce 7800 GTX

MAXIMUM PC VERDICT 10

$600, www.xfxforce.com

Benchmark:	Leadtek WinFast PX6600 GT TDH Extreme	ATI Radeon X800 XL	ATI Radeon X850 XT P.E.	eVGA e-GeForce 6800 Ultra	XFX GeForce 7800 GTX
Price	$200	$300	$500	$500	$600
3D Mark 05	3,950	5,536	6,259	5,536	8,054
3D Mark 03	9,172	10,920	13,588	12,949	16,898
3D Mark 03, Game 2 (fps)	14.1	22.1	28.2	26.6	37.0
3D Mark 03, Game 4 (fps)	18.8	32.1	36.2	33.6	54.9
Halo (fps)	48.0	54.9	72.51	71.1	107.9
Doom 3 (fps)	21.1	31.0	41.7	43.5	56.7
Far Cry (fps)	30.1	60	65.1	62.0	84.3

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How to Buy a Hard Drive

Do you really need to spring for 10,000 rpms?

Hard drives have improved leaps and bounds in the last few years, and while a super-fast drive won't improve your frame rate at all, it can certainly help levels load faster and provide more than enough space for all your games, MP3s, and more. The most important features to consider when shopping for a gaming drive are storage capacity, buffer size, and rotational speed.

Buffer: Every hard drive has a tiny bit of onboard memory that is known as the buffer or cache. When data is retrieved from the platters it is put into the cache so that if after you close something that you just retrieved (say, a *Word* document) and you suddenly decide you need to open it again, the document can be read directly from the cache. This saves the drive's read/write heads from needing to go all the way back to where the file was on the platter to read it again. This saves a lot of time, as data can be retrieved from memory almost instantly. A general rule with buffer size is the bigger, the better. Today's minimum is 8MB, and several high-end drives now ship with 16MB buffers.

Capacity: Like cache, the general rule with capacity is also the bigger, the better. Though everyone's size requirements are different, we find a safe rule of thumb is 250GB as the minimum for a high-end gaming machine. Drives are available today in sizes ranging from 80GB all the way up to 500GB, so it's generally true that drives in the 200GB to 250GB range are in the "sweet spot" in terms of price and capacity. As an example, a 500GB drive is $500, so it's $1 per gigabyte, but 250GB drives are only $120, which is $0.48 per gigabyte.

Interface: There are two interfaces available for hard drives, and there's not much difference between them in terms of performance, so when deciding which is right for you the primary consideration should be what type of ports your motherboard offers. The standard interface is called Parallel ATA (also known as ATA or Ultra ATA). This interface uses a 40-pin connector with wide, flat ribbon cables; has been around for quite some time now; and is found on all motherboards. The parallel interface is currently being phased out in favor of a newer, faster interface named Serial ATA, which uses thin cables. SATA's benefits include the fact that you don't have to set jumpers (which is required with ATA devices), and that its smaller cables don't inhibit airflow as much as the archaic ATA cables.

Rotational speed: Because hard drives operate by rotating a platter underneath a pair of read/write heads to retrieve data, the faster the platters spin, the less time you spend waiting for data to be retrieved. The most common rotational speed for consumer-level hard drives is 7,200rpm, which is the minimum you should accept in a gaming drive.

Maxtor DiamondMax 10

The DiamondMax 10 is our favorite 7,200rpm drive because it's super-fast, quite spacious at 300GB, and runs cool and quiet at all times. There are bigger drives out now that are 400GB and 500GB, but they are expensive, and not quite as fast as the DiamondMax in some benchmarks. The drive's superior speed is due to its hefty 16MB buffer and reasonably high platter density (it uses three 100GB platters). We've been using DiamondMax 10 drives in our zero point test beds in the Lab, and they've been serving us faithfully for the better part of this year.

Western Digital Raptor 740GD

The 74GB Raptor is the fastest desktop drive around in most benchmarks, mostly due to the fact that it's the only Serial ATA drive on the market with a 10,000rpm rotational speed (every other SATA drive spins at 7,200rpm). Its 4ms average seek time is roughly twice as fast as what you get with a 7,200rpm drive, and it's the real deal. Raptor drives feel incredibly responsive and fast, even when doing mundane desktop work. The only caveat is its 74GB capacity, which is rather small. But given its ultra-fast seek times, the Raptor is a must-have if all-out performance is more important to you than capacity.

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How to Buy an Optical Drive

Rip, burn, repeat—faster than ever before!

Optical drives are so cheap these days that they may as well be sold in subway vending machines. Even the least expensive drives are of fairly good quality and are often bundled with software that's sold separately for more than the price of the drive itself!

But there's good reason to shell out a few extra bucks for a premium drive — the primary one being, naturally, sheer speed. If you install a lot of games on your PC, then an optical drive with a fast read speed (at least 32x for CDs and 8x for DVDs) can shave minutes off the time it takes to install a massive game like *Dungeon Siege 2*. Another reason is that many top-shelf optical drives use homebrew technologies to reduce drive noise, such as the vibration control mechanism in Samsung's TS-H552U ($75, www.samsung.com).

Double-layer recording isn't exactly driving the crowds wild just yet. Despite holding 8.5GB of video or data versus 4.7GB on a traditional recordable DVD, double-layer discs remain expensive (still hovering around $10 each), and the desire for the technology simply isn't there—yet. We think double-layer recording will really bust out once the media falls below $4: combine the generous capacity of double-layer discs with high-quality video-compression technology (like DivX 6), and you've got a very cheap alternative to recording large amounts of video (even high-definition video) without importing a Japanese $3,000 DVD burner that uses blue laser technology.

Dual-Format Disgrace

The first wave of DVD burners used one of two leading formats: DVD-R or DVD+R. The folks behind each standard salivated at the prospect of pocketing a few cents for every single disc sold (as Philips does with its patented Compact Disc), and refused to negotiate toward a single, consumer-friendly standard. They chose instead to push manufacturers to adopt one or the other, and the result is that manufacturers and resellers suffered extremely high return rates as consumers bought DVD-R drives and tried to use them with DVD+R media (or vice-versa), and assumed the drive was defective when the combination didn't work. That's why virtually every optical drive sold today supports both formats.

PlexWriter PX-716A DVD Burner

Reading from CDs at 32x and from DVDs at a blazing 16x, the PX-716A is a gamer's best friend. And we're not at all surprised that the PX-716A turned in a record-breaking time writing 4.25GB to a single-layer DVD+R disc in 5:50 (min:sec); we're accustomed to cutting-edge speeds from Plextor. What really amazes us is the unprecedented speed with which the PX-716A writes to double-layer media. The 716A broke the 20-minute barrier writing 8.3GB of data to a DVD+R DL disc in just 18:16 (min:sec), which it did by writing at 6x to media rated for 2.4x speed! And the icing on the cake is the bundled *Easy Media Creator 7* suite.

PlexWriter PX-716A DVD Burner

MAXIMUM PC VERDICT 10

$140, www.plextor.com

BenQ LightScribe DVD ReWriter

Gamers won't be disappointed with read speeds of 48x from CDs and 8x from DVDs, but what makes BenQ's DVD ReWriter really unique is the LightScribe technology licensed from the gnomes at HP, which modulates the strength of the burning laser to etch a gray-scale image onto a special dye coating on the label side of a LightScribe disc.

Burning a complex image at maximum quality can take a long time and the results are very low-contrast, but the detail is very impressive—we could even see the whiskers on a photograph of a cat, and 10-point italicized white type came out easily legible. The ReWriter will even burn your track list on an audio CD—all you have to do is flip the disc. The drive isn't just about LightScribe, though: BenQ set a record burning 4.25GB to a 16x single-layer recordable DVD+R with a time of 5:41. And it comes with *Nero Express*.

BenQ LightScribe DVD ReWriter

MAXIMUM PC VERDICT 8

$120, www.benq.com

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How to Buy a PSU

Don't overlook the importance of a good power supply!

The Power Supply Unit (PSU) is the Rodney Dangerfield of modern computing. Tucked away deep inside the PC case, it's rarely thought of, yet is one of the most important components in today's PCs. Think about it: What is on all the time, continuously providing all of your PC's greedy components with its much-needed power? The PSU, of course, and though they all look the same, there can be quite a difference between them. The bottom line though is that if you're willing to spend good money on high-end parts for your PC, the best investment you can make to ensure their long-term operation is to feed them power from a top-quality PSU.

Wattage rating: This is the PSU's "big enchilada," as how many watts it's rated at determines how much juice it can provide to the components inside your rig. As a rule, every component requires some watts from the PSU, so the more components you have, the more watts you're going to need. As a baseline, a standard one-videocard, one-hard-drive system can get by just fine with a 350W PSU, though super-loaded gaming rigs often require 500W-and-higher PSUs.

ATX connector: Every PSU connects to your motherboard with a fat ATX power connector, but there has recently been an upgrade in this specification from a 20-pin connector to a 24-pin connector (dubbed ATX 2.0). Be sure to check what kind of connector is on your motherboard before plunking down cash for one. Also know that PCI Express-based videocards require a special power connector that is not found on older PSUs, so check for that as well.

Detachable cables: In the old days, a PSU had a certain number of cables coming out of it, and if you didn't use two of them, well, you just tucked them out of the way the best you could. Some of today's high-end PSUs are modular, though, in that each individual power cable is connected individually, so you only plug in what you need and leave the rest of the cables in the box. This is great, as it reduces case clutter considerably. The only problem is that by plugging the power cable into the PSU, you are creating a weak spot in the power line that could cause a problem at some point (though we've never experienced any problems with these types of connectors).

Cooling: All PSUs require some form of active cooling due to the amount of heat they generate. We prefer PSUs with large, slow-spinning 12cm fans because they provide adequate cooling without making a lot of noise. PSUs that use smaller 8cm or 9.2cm fans usually make more noise because the smaller fans have to spin at a higher speed to generate sufficient airflow.

Antec NeoPower 480

This sweet PSU earned a perfect 10 Kick Ass rating in our January 2005 issue, and for good reason. It has every next-gen connector available, includes modular cables, and didn't even flinch at our grueling stress tests. It sports an almost totally silent 12cm fan, which tickles our fancy, and its beautiful charcoal finish is classy. But more importantly, it provides tons of pure power—more than enough to fuel even the burliest gaming rigs. The icing on the cake is that it includes two fan-only power leads that dynamically adjust fan speed according to case temperature!

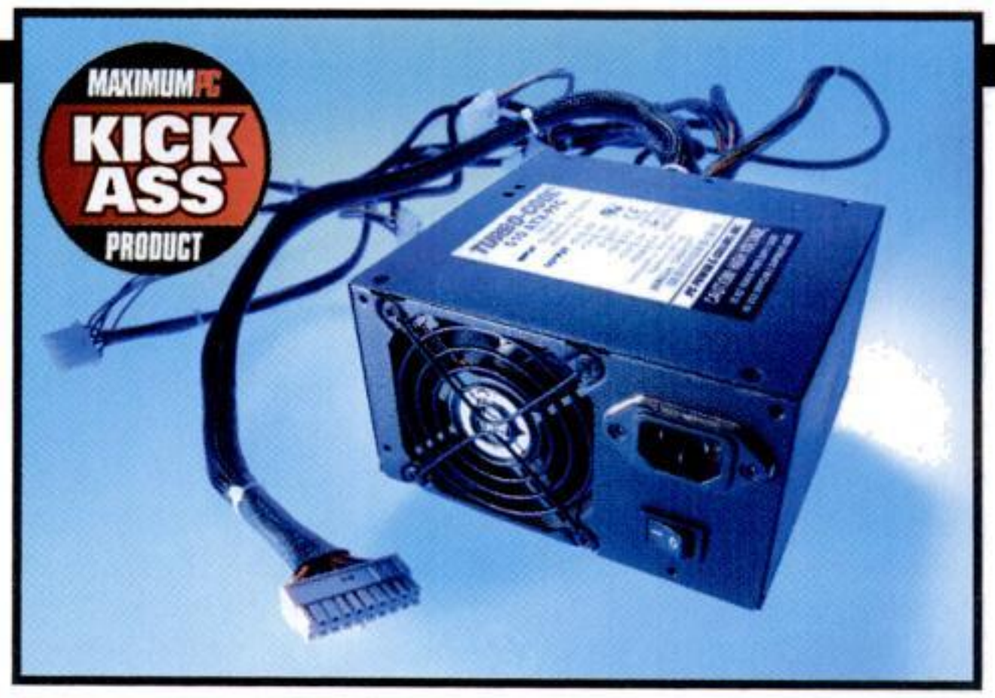
Antec NeoPower 480

MAXIMUM PC VERDICT **10**

$110, www.antec.com

PC Power and Cooling Turbo-Cool 510 Deluxe

What it lacks in outright sex appeal, the PC Power and Cooling 510 Turbo more than makes up for in sheer performance. This sucker can handle anything you throw at it, and is the PSU we are currently using in all of our machines in The Lab. It features sleeved cables, a very stout all-steel body, and lengthy cables that are perfect for full-size enclosures. It doesn't offer modular cables (PC Power and Cooling says they are less efficient than connected cables), but it makes up for it with power output that is always rock-steady regardless of how much stress we put on it!



PC Power and Cooling Turbo-Cool 510 Deluxe

MAXIMUM PC VERDICT **9**

$190, www.pcpowerandcooling.com

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How to Choose a Display

LCDs vs CRTs: Out with the old, in with the new...

Not long ago, there was no question about which display technology was the best for gaming: CRT was the only way to go. No serious gamer would tell you otherwise. Invented back in the 1920s (it's the very same technology used in TV sets), the cathode-ray tube's many more years of refinement gave it a clear advantage over burgeoning technologies such as liquid-crystal diode (LCD) displays; plus, CRTs have qualities that you can't get from anything else.

For instance, a CRT is uniquely capable of displaying every single color and gray-scale a videocard can produce. It's also able to produce a true black and the highest contrast levels available. CRTs are also notable for their ability to display any resolution or aspect ratio without resorting to image rescaling.

And, finally, a CRT's comparatively speedy response time (aka refresh rate) makes it ideal for displaying fast-motion content without betraying any hint of streaking or trailing.

But CRTs aren't perfect. Compared with LCDs, they're heavy as hell, emit more heat, and consume much more desk space. Plus, their image is more prone to geometric distortion, caused by magnetic interference from nearby electronic equipment. Given such drawbacks, and the ever-improving quality of LCDs, the choice for gamers is not as clear-cut as it used to be. We're now finding LCDs that are nearly on par with CRTs in color and gray-scale reproduction, and they're much better than in the past at reproducing black. What's more, as pixel-response times have dropped, issues such as ghosting and smearing are virtually nonexistent in the majority of high-end LCD models. Add to this the fact that LCDs are brighter and their pictures generally sharper than their CRT counterparts, and you have a mighty compelling alternative for gaming.

True, there's always the matter of an LCD's relatively high—and resource-demanding—fixed, or native, resolution. However, a serious gamer should have a serious system, and a serious system shouldn't have any problem playing even *Doom 3* at the native resolution of a 19- or 20-inch LCD display.

Our buyer's guide will imform you about which specs matter, before you go out and plunk down cash on a new display.

CRTs

Screen size: Know that a "19-inch" CRT doesn't offer 19 diagonal inches of screen real estate; it actually amounts to about 18 inches. Pay attention to the spec associated with viewing area if you want to know exactly how much screen you're getting.

Dot and grille pitch: A CRT's sharpness is directly related to its dot or grille pitch. In simple terms, a monitor's pitch describes the distance between one of its phosphor dots and the next closest dot of exactly the same color. In general, regardless of which type of CRT you buy, the lesser the pitch, the finer the screen pixels, and thus the sharper the overall image.

Resolution/refresh rate: Every CRT displays a matrix of dots to describe whatever image is being presented onscreen. This matrix it called its resolution. The lowest standard resolution you'll ever see supported is 640x480 (480 lines of 640 individual dots), but the best consumer CRTs can display 2048x1536. The higher the resolution, the more visual information that can be displayed on your screen. Do you really need a 2048x1536 display? Probably not. Still, support for high resolutions indicates that the display will also be able to display lower resolutions at a great refresh rate.

A monitor's refresh rate is directly related to its resolution. In simple terms, the refresh rate describes how many times per second a CRT redraws its screen. But here's the catch: The higher the resolution setting, the more difficult it is to redraw the screen. Thus, as resolutions go up, refresh rates go down. This is true for all CRTs. The key is finding a CRT that can maintain high refresh rates (75Hz and above) at high resolutions. We suggest that you avoid any CRT that can't maintain a refresh rate of at least 85Hz at 1600x1200. A refresh rate under 75Hz will give you eyestrain, and any rate above 85Hz could possibly result in blurry content.

LCDs

Screen size: When an LCD is marketed as a 17-inch display, you really get 17 inches of diagonal screen real estate. We consider

NEC MultiSync FE2111

If you simply must have a CRT, we recommend NEC's FE2111. This monitor boasts a big, perfectly flat, 20-inch screen; a fine 0.24mm grille pitch; and at its maximum resolution of 1920x1440, it has a refresh rate of 76Hz. These specs translate into superb performance, and have made the FE2111 *Maximum PC's* top-pick CRT for more than a year.

Be warned, however, that you won't find this monitor advertised on NEC's website—in fact, the company no longer pimps CRTs, period (a sign of the overall waning interest in the category). Still, the FE2111 can easily be found—we had no problem locating a number of vendors selling the display through PriceGrabber.com.

NEC MultiSync FE2111

MAXIMUM PC VERDICT 9

$300-$600, www.nec.com

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19-inches the minimum for all-purpose computing. You need at least that much screen real estate to work in multiple windows comfortably, and to thoroughly enjoy high-definition video and games.

Aspect ratio: A display's aspect ratio is its screen width divided by its height. The majority of desktop monitors have an aspect ratio of 4:3, regardless of their screen size; and the majority of software applications and computer games are designed accordingly. This is something to bear in mind if you're considering a widescreen model, which typically has an aspect ratio of 16:9. If an application, such as a game, insists on a 4:3 ratio, it will stretch the content to fill the entire screen, making everything look fatter than it should. This is becoming less of a problem every day, as most games support at least one widescreen mode that isn't distorted.

Native resolution: Every LCD sports a fixed number of pixels arrayed in a grid a certain number of pixels high and a certain number of pixels wide. The native resolution is the width of the display (in pixels) by the height (in pixels). The native resolution will deliver an optimum picture. While it's possible to run an LCD at a lower, non-native resolution, the image will be rescaled and the display will use interpolation to fill in the missing pixels, which can degrade image quality. Native resolution and interpolation quality is of particular concern to gamers, who often run games at low resolutions to get the best frame rate.

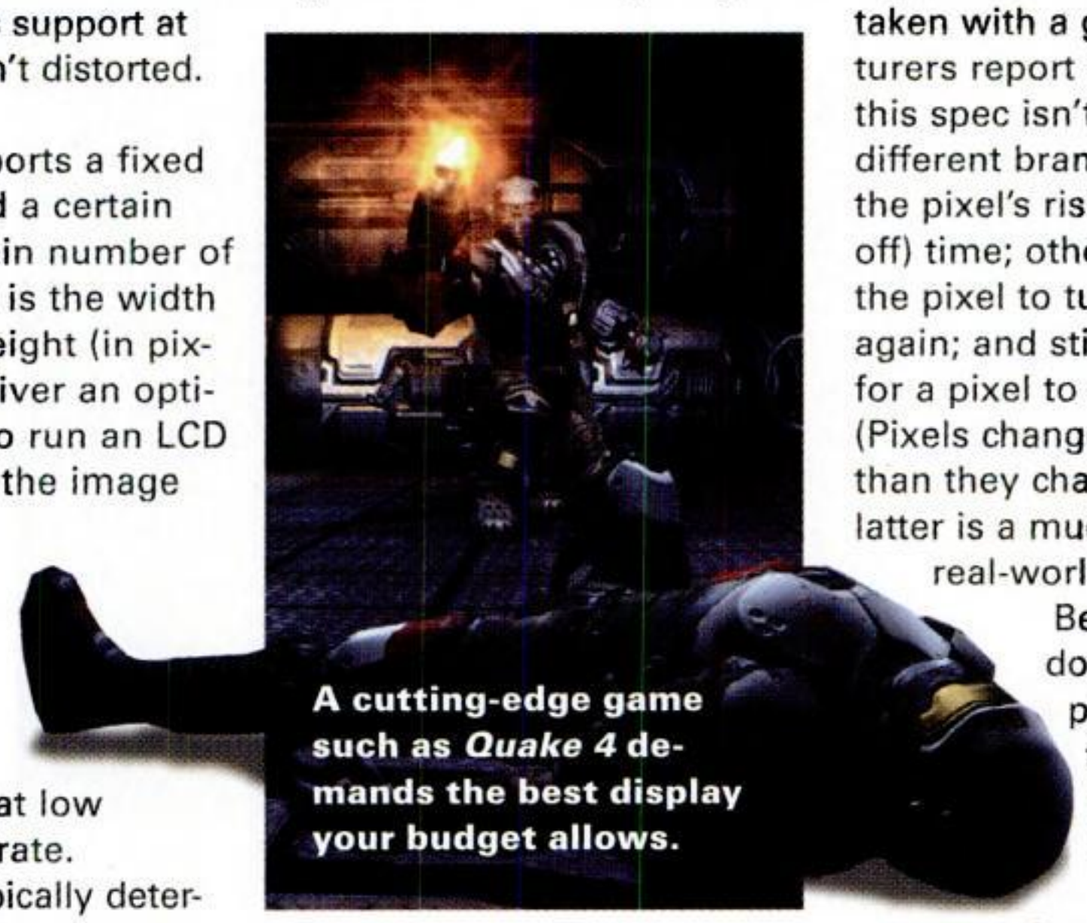
An LCD's native resolution is typically determined by its screen size. For example, most 19-inch monitors have a native resolution of 1280x1024, while 20-inch models tend to have a native resolution of 1600x1200. A higher resolution makes everything look smaller on-screen, but also gives you a larger desktop.

Interface: Today's LCDs connect to the graphics board via either an analog VGA connector or a digital DVI connector. If your graphics board is equipped with DVI outputs—most modern boards are—we recommend you use DVI to connect to your LCD.

The analog connection is less precise because the digital information must be converted to an analog stream in order to travel to the LCD, where it is then analyzed and converted back to a digital format.

Pixel response time: This spec has been getting a lot of play lately, so it deserves mention. A pixel's response time, measured in milliseconds, describes the time it takes for a pixel to change from its on state to its off state and then back on again. If the response time is too slow, you'll see ghosting and other artifacts because the display's pixels can't keep pace with the information sent from the graphics card. This problem is particularly noticeable in games, naturally.

A response time of 25ms was once the norm, but it's not uncommon these days to see response times listed in the single digits. As impressive as this spec sounds, it should be taken with a grain of salt. Different manufacturers report response times differently, so this spec isn't a reliable means of comparing different brands. Some vendors report only the pixel's rising (turning on) or falling (turning off) time; others report how long it takes for the pixel to turn on, turn off, and then turn on again; and still others report the time it takes for a pixel to go from peak white to full black. (Pixels change from white to black much faster than they change from gray to gray, but the latter is a much more common occurrence in real-world use.)



A cutting-edge game such as *Quake 4* demands the best display your budget allows.

Because of this inconsistency, we don't normally report on a display's pixel response time. The best way to determine an LCD's abilities with fast-paced content, in our opinion, is to eyeball it firsthand.

Controls: The degree to which you can adjust an LCD's picture via the onscreen display (OSD) varies; in some cases, you have fewer options with the digital interface because the manufacturer cheaped out. (Adding hardware to the display that allows the user to manipulate the image detracts from the manufacturer's bottom line.) We think it's important to have at least some control over color, brightness, and contrast.

Ergonomics: Obviously, the more ability you have to adjust your screen's height, tilt, and orientation to fit your body, the better.

Shuttle XP17 Lite

Shuttle is a pioneer of small formfactor boxes and the brand remains a favorite of LAN-party enthusiasts, so the be-handled, 17-inch XP17 Lite is an obvious companion piece to the popular wee gaming PCs. Like those machines, the XP17 Lite LCD sports a sleek, stylish, high-tech aesthetic.

Images also look bright and lively on the XP17's 1290x1024, glossy screen—though the shiny surface can be distractingly reflective in well-lit environments. For gaming, the XP17's performance is very strong, and it's easily portable.

Shuttle XP17 Lite

MAXIMUM PC VERDICT 9

$390, www.shuttle.com

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Philips 1905P

From its simple black bezel, to its telescoping/pivoting neck, to its amazing performance and its ultra-competitive price, the Philips 1905P has us smitten. Compared with other high-performance desktop LCDs, this one truly shines. The 1905P's 19-inch screen is capable of a dark, dense black level. Its gray-scale reproduction is smooth and completely free of artifacts—virtually indistinguishable from our reference CRT. In fact, the CRT-like performance continued through all our tests. In digital images, flesh tones looked life-like, shadows and reflections looked realistic, colors were vibrant, and every fine detail was perfectly reproduced.

To boot, we found that DVD action sequences played without a hitch, and fast-paced gaming was perfectly acceptable at the 1905P's native 1280x1024 and non-native resolutions.

Philips 1905P

MAXIMUM PC VERDICT 9

$580, www.philips.com

Dell 2405FPW

Dell's 2405FPW epitomizes the dramatic advance of LCD technology. To think that you can now have a 24-inch, flat-panel display for less than a grand! And at no sacrifice to performance. Indeed, the 2405FPW did quite well in all of our *DisplayMate* test scripts. The screen's only shortcoming was in the 256-step scales, where subtle signs of compression and expansion were evident at various steps. But unless you're doing exacting color matching, you probably won't notice this in real-world use—we certainly didn't when viewing digital images, DVDs, or games. All of the above looked gorgeous on the 2405FPW's ultra-expansive screen.

What's more, this display offers plenty of image-adjustment options through the digital interface, a slew of inputs, and picture-in-picture functionality.

Dell 2405FPW

MAXIMUM PC VERDICT 9

$960, www.dell.com

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Sound Advice

Do you still need an add-in soundcard?

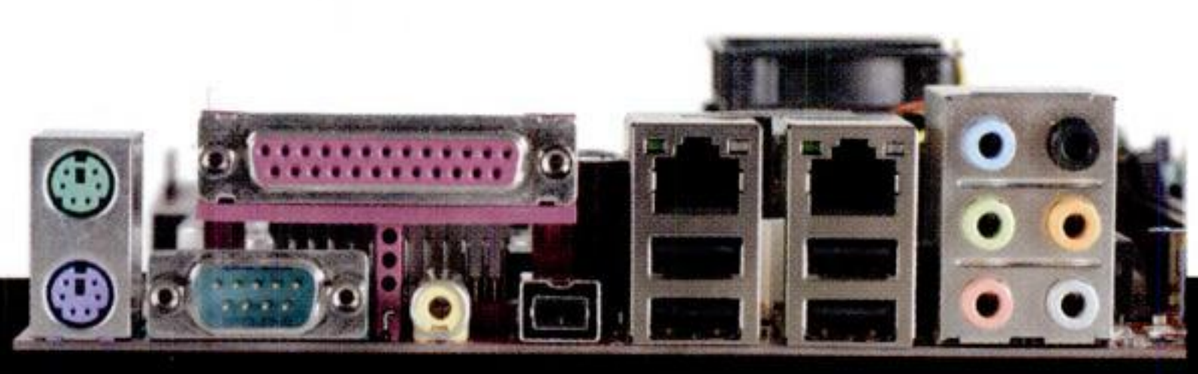
Last year Intel introduced a new spec called HD Audio that could be the soundcard's death knell. HD Audio is a major revision to the AC97 audio spec that's been powering most onboard audio since, well, 1997. HD Audio ratchets up the components from AC97's 16- to 18-bit parts to full 24-bit with up to 192kHz sample rates, which delivers audio that's on par with today's best soundcards (in specs anyway.)

HD Audio also happens to find a really good use to keep your CPU busy. Currently, when you plug your PC into your home-theater audio system using a digital SPDIF or optical cable, the only time you can get true digital surround sound is with DVD movies on your PC. Gaming, and any other application where sound is created on the fly, is stereo-only. HD Audio gives motherboard vendors the option of running Dolby Digital Live, which takes the surround-sound audio from a game and encodes it in real time to a format that your home-theater receiver can understand.

There is a catch. Even though the best HD Audio components are 24-bit, they must still be mounted on a motherboard, which subjects the audio to all sorts of electrical interference, or "noise".

Also, while add-in soundcards such as Creative Labs' Audigy 2 ZS and new X-Fi use their own digital signal processors (DSP) to perform audio chores, HD Audio uses your CPU. The sound of a bullet zinging over your head, for example, requires calculations to add a Doppler effect or echo. With just about all of today's on-board audio, the CPU must calculate the sound effect. Most hard-core gamers believe that any time the CPU's attention is diverted, frame rates go down. That's generally been true, but much of that thinking evolved in the days of the 400MHz Pentium II processor.

So does that mean Intel has finally put the last nail into the soundcard's coffin? No. Soundcards still offer higher-quality audio because the components are elevated off of the noisy motherboard. Plus, features such as DVD Audio are only available with a soundcard because of copyright issues. And while many people will be content to lose 5 percent of performance using onboard audio, many hard-core gamers won't give it up. And when you look at the features of Creative Labs' new X-Fi card, we'd say that the soundcard really isn't dead—yet.



Onboard audio's getting better, thanks to Intel's HD Audio spec.

24-bit Dolby Digital Live surround sound is no longer a pipedream for the PC.

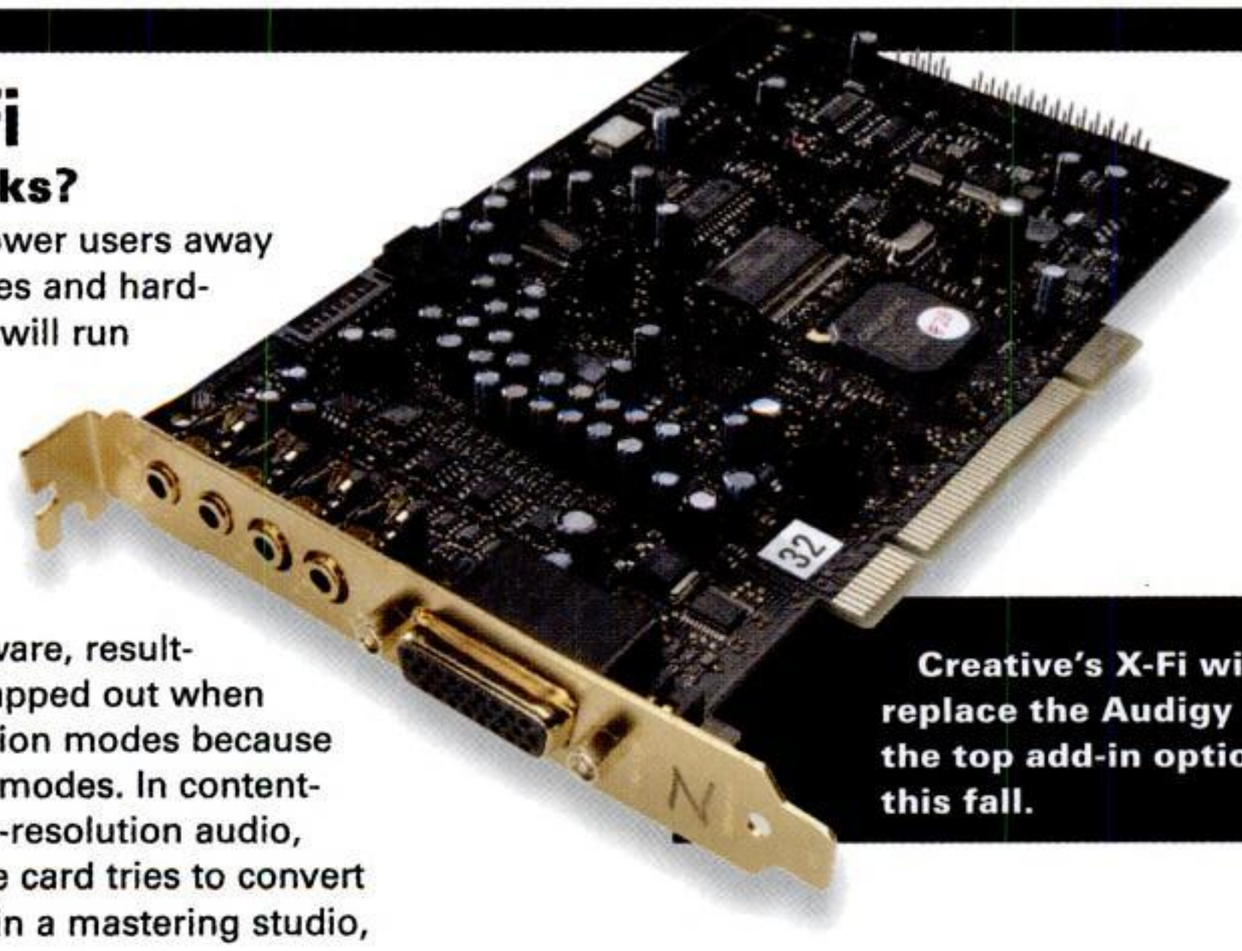
Sneak Peek: Sound Blaster X-Fi

Can Creative teach an old dog new tricks?

With its new X-Fi, Creative hopes to woo gamers and power users away using onboard audio—offering a dazzling array of features and hardware designed to fulfill *all* of your audio needs. The X-Fi will run in three different modes: entertainment, gaming, and content creation. By reprogramming the DSP for each special task, Creative says it can wring the most performance out of one part that's designed to do everything at once.

In gaming, for example, the DSP would be programmed to process real-time 3D sound effects in hardware, resulting in better frame rates. That feature would then be swapped out when the card is running in the entertainment or content-creation modes because real-time 3D audio performance is not required in these modes. In content-creation mode, the card could record multi-channel high-resolution audio, which isn't needed in games. In entertainment mode, the card tries to convert 16-bit material to 24-bit the same way it would be done in a mastering studio, Creative says.

Creative hasn't released pricing on the new X-Fi cards. However, four versions are expected to debut this fall that will mirror the current Audigy 2 ZS.



Creative's X-Fi will replace the Audigy 2 as the top add-in option this fall.

How to Choose Speakers

If you want a kickass gaming experience, don't skimp on your speakers!

One of the biggest mistakes you can make when putting together a PC gaming system is to underestimate the critical importance of sound reproduction. Leading game developers are pouring tremendous resources into the audio side of their game designs, so that their games sound as good as they look.

And with good reason: Independent research has proven that our perception of visual quality is directly affected by the quality of the audio that accompanies it. In the gaming world, this means that you'll get more enjoyment out of a game if you play it through a good set of speakers or headphones.

The big question, then, is what features define a good set of speakers or headphones? We'll show you what to look for, and what we consider to be some of the best products in their class.

Speakers

AMPLIFIER: When you're talking about speakers for your PC (often called "multimedia speakers"), it's absolutely essential that the speakers be self-amplified. A lot of manufacturers will throw around amplifier specs such as "500 watts of power!" Don't be impressed until you know the speakers' meaningful specs, which will be expressed as "N watts per channel, RMS." RMS (root mean square) is a formula for describing the level of a signal, and it is considered the most accurate means of measuring an amplifier's output.

SPECS: Don't be over-influenced by manufacturers' specifications. A modern, efficient amp can drive speakers effectively without pumping massive amounts of power into them. This is especially true for multimedia speakers, since they're designed for near-field listening. An amplifier's total harmonic distortion (THD) rating, for instance, is at least as important as its power output: An amp that pumps out 100 watts per channel RMS will sound like crap if it's generating more than one or two percent THD (THD ratings are inevitably higher for subwoofers).

If at all possible, insist on a personal listening test before throwing down your cash for any speaker system.

SURROUND SOUND: Game developers are following the movie industry's lead in creating multi-channel soundtracks. If your computer is equipped to decode these soundtracks and you can swing the budget for a 5.1-channel (or higher) speaker system, you'll enjoy listening to audio events in games emanating from specific speakers (an enemy shooting at you from behind, for instance).

A 5.1-channel speaker system will actually consist of six components: right and left front satellites, right and left surround satellites, a center speaker, and a subwoofer (for low-frequency sound effects). A 6.1-channel system adds a rear center speaker, and a 7.1-channel system adds left and right rear speakers. If you're on a tight budget, however, you'll be better served by a good 2.1-channel system (stereo satellites and a subwoofer) than by a cheapo surround-sound system.

Some multimedia speaker systems are equipped with digital audio inputs and hardware for decoding surround-sound algorithms, such as Dolby Digital and DTS. This is a handy feature if you're going to plug in a PS2 or Xbox into your speaker system. THX, on the other hand, is *not* a surround-sound algorithm;

continued on page 36

Klipsch GMX A-2.1

Klipsch's GMX A-2.1 system has become the benchmark for 2.1-channel excellence. The two-way satellites pivot on a ball, so you can adjust them to face up, down, left, or right. The subwoofer has a rear-facing port that runs the entire width of the enclosure. We're less enthused with the remote-control pod: It takes up a lot of space, and the rear-mounted headphone jack is difficult to reach.

These speakers sound absolutely *huge*, proving the point that an amp doesn't need to *be* huge to sound great: this one puts out 14 watts per channel to the satellites, and 50 watts to the sub. When we cranked the volume, we felt the need to take a few steps back to fully appreciate the quality and quantity of rich, luscious audio washing over us.

KLIPSCH GMX A-2.1

MAXIMUM PC VERDICT 9

$150, www.klipsch.com

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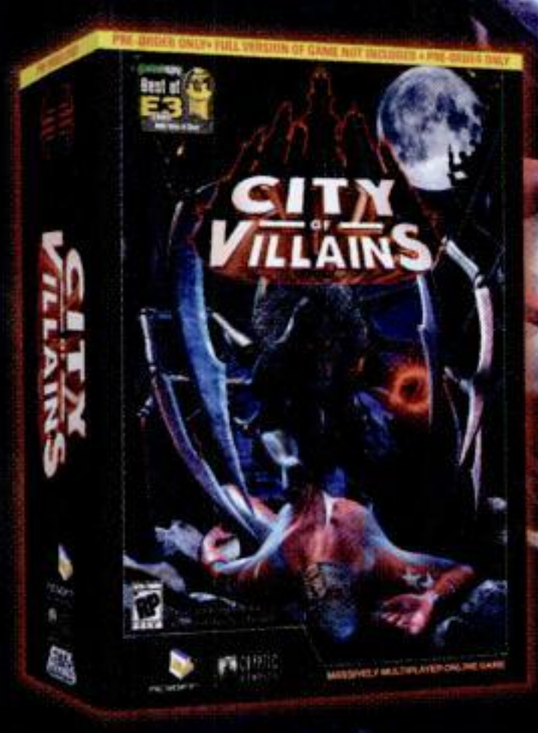

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rather, it is an audio-video certification. Products that comply with a set of standards established by Lucasfilm, Ltd. are bestowed with THX certification.

SHIELDED SATELLITES: Your satellite speakers will likely be in close proximity to your video monitor, so it's essential that their cabinets be magnetically shielded; otherwise, they'll eventually damage your monitor. This is less of a concern for your subwoofer, since it will be most likely be placed on the floor.

REMOTE CONTROL: You'll need to control some aspects of your audio experience using software, but it's much easier to set the volume with a big old-fashioned knob. If you anticipate using headphones, look for a conveniently placed headphone jack either on one of the satellite speakers or on the speakers' control pod.

Headphones

This category can be divided into three components: stereo, surround-sound, and headsets (headphones with an attached boom mic). As with speakers, you'll be infinitely more satisfied with quality stereo headphones or a headset than an inferior set of surround-sound 'phones. As with speakers, you should audition any headphones you're considering buying. Here are some of the features you should look for:

EARCUPS: Circumaural headphones have earcups that surround your ears. Many people find these to be more comfortable than supra-aural headphones, which sit on top of your ears (especially folks who wear glasses). Earbuds fit inside your ear canal.

OPEN BACK VS. CLOSED BACK: This is a matter of tradeoffs: Open-back headphones have vents, which allow the speakers inside to resonate. Closed-back headphones are sealed, which reduces the amount of sound that leaks out.

NOISE-CANCELLING: These types of headphones have tiny microphones that pick up ambient noise, and circuitry that generates noise of the opposite phase to cancel it out. They'll help shut out your PC's fan noise, but most of the ones we've tested have produced detectable noise when no source signal was present.

WIRELESS: These types of headphones have a powered transmitter that plugs into your PC and sends an audio signal to the 'phones using radio frequencies or infrared. The RF models we've tested have been noisy, and the infrared models depend on line-of-sight.

Logitech Z-5500 Digital

The drivers in Logitech's Z-5500 satellites produce killer treble and midrange. The gargantuan subwoofer— the amp feeds 188 watts to its massive 10-inch driver—produces bowel-loosening bass whether you're blowing things up in games or rocking out to music. The amp's remaining 317 watts of power are distributed to the satellite channels: 62 watts to the front and surround channels; 69 watts to the center channel. A hardware decoder handles Dolby Digital, DTS, *and* DTS 96/24 signals. The 5.1 system is THX-certified, too.

The elegantly designed tethered remote control features a huge, highly responsive, weighted control wheel; a very bright, high-contrast LCD display; a headphone jack; and a handy auxiliary input (perfect for plugging in your MP3 player). The remote enables you to control almost every audio function, including source select; surround-sound parameters; and levels for volume, fade, subwoofer, and center.

Steel Sound 5H USB

The new Steel Sound 5H USBs look like a standard set of 'phones, but don't let the Clark Kent guise fool ya—outside of their appearance, there's little ordinary about them.

Developed with input from professional gamers, the 5Hs are lightweight (for their size) and feature a built-in retractable, and flexible, microphone (indispensable for games such as *Battlefield 2).* An onboard digital signal processor enables the 'phones to deliver *extremely* crisp positional audio cues. We'd like more impressive bass, but the 5Hs really shine when it comes to more subtle sound effects such as footsteps, reloading a weapon, or the "plop" of a grenade landing beside you.

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Who says money can't buy love?

Intimately elegant and intuitively intelligent every Saitek product glows with striking good looks and eye-catching style. Perhaps it's their sculpted lines and perfect curves that make them so irresistible. Or perhaps it's their incomparable features and abilities that set them apart from all others. Then again it could be their sophisticated intelligence and programmability that caters for every need you have. Maybe it's the way they feel or the way they respond when you gently touch them, instructing them to do what you want. It could also be the superior craftsmanship, passion and attention to detail that goes into making the world's most loved and wanted **PC game gear**. And when all is considered there is little else to explain the ultimate exhilaration and satisfaction you'll discover the moment you unwrap yours.

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How to Buy a Case

Give your components a good home!

Though most people upgrade videocards and hard drives on an annual basis, they rarely upgrade their PC case, unless tragedy strikes. The reason is simple: The ATX specification for cases has been around a long time, and it's still getting the job done. Simply put, there's usually little reason to upgrade unless you're looking for more room, more cooling or a more pleasing aesthetic. Indeed, these are the most important characteristics of a case: it must be able to hold all your hardware, and have enough fans to keep everything cool and relatively quiet.

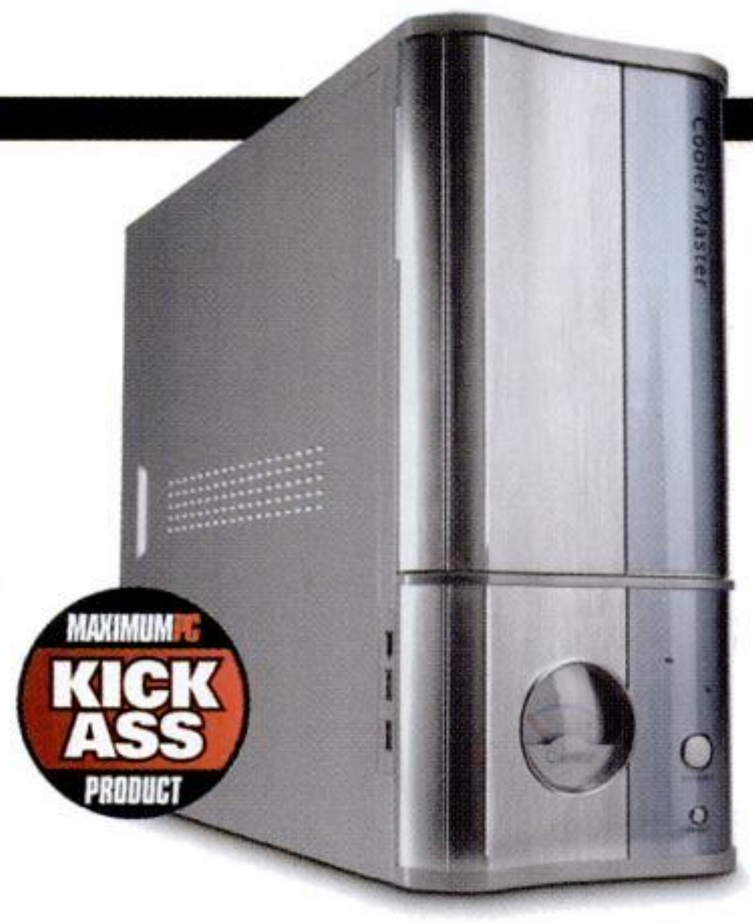
Case fans: All cases include some sort of cooling system, though whether or not the actual fans are inside the case at the time of purchase varies. Regardless, every case has fan mounts, and it's important to see what size they are prior to purchase. We typically favor large 12cm fans because they spin slowly, and therefore are relatively nice and quiet—and move a lot of air. You'll want to make sure there's a fan in the lower front of the case to suck air into the PC, and a nice, big fan in the back to blow it out. Some fans include exhaust fans on the top or side of the case, too, but these aren't always necessary and can add a lot of unwanted noise.

Form factor: The lion's share of consumer-level motherboards conform to the ATX specification, so make sure the case in question supports this standard (most do). Once you know it supports ATX, the only big question left is how big do you want to go? There's mid-tower cases, which are the size of what most consider to be a "regular" desktop, and there's full-tower cases, which are much larger and longer than a mid-tower. Though their size makes them unsuitable for frequent transport to LAN parties, full-size towers are a breeze to work in given their cavernous interiors. They can also hold a lot of hardware, which is nice if you have several hard drives, are running SLI, or are thinking about investing in water cooling. For most users, however, a mid-tower will be more than sufficient.

Front-mounted USB: This feature—having USB ports mounted on the front of the case for easy access—used to be a delicacy, but it is now almost standard fare. Still, pay attention to their location, as sometimes they're on the bottom-front of the case, and other cases put them right at the top, which is nice if your PC is resting on the floor. Some also offer front-mounted audio jacks and FireWire, which may be important to you.

Cooler Master Cavalier 1

This dreamy mid-tower is one of our favorites due to its elegant design, ample cooling, and tool-less interior. All optical and magnetic drives slide into their respective bays (and there's more than enough of them) and are fastened via simple sliding levers that lock the drives in place. Even PCI cards are attached snugly with a simple plastic lever. Cooling duties are handled by a 8cm fan up front and a 12cm fan in the back, which is fantastic. And the swing-out door that covers the front bezel can be tweaked to open from either direction, depending on whether your PC sits to your left or your right.



Cooler Master Cavalier 1

MAXIMUM PC VERDICT 9

$120, www.coolermaster.com

Thermaltake Armor VA8000SWA

Don't let this case's giant stature fool you. It's a full-size enclosure all right, but it's made entirely of aluminum and is therefore lighter than most mid-towers. It has a whopping 10 drive bays, including a removable three-drive bay with its very own LED-lit 12cm fan. You can even move the bay with the power switch and USB ports to any location you like. A huge, LED-lit 12cm-fan exhausts hot air out the back, and there's even pre-drilled holes in the back for a water-cooling setup. The best part? One of the drive bays is a pull-out tool holder!

Thermaltake Armor VA8000SWA

MAXIMUM PC VERDICT 9

$190, www.thermaltake.com

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How to Catch a Mouse

You'll only play as well as your mouse lets you

Buying a mouse used to be a simple task: You went out, picked up one that felt good in your hand, and called it a day. Now there are dozens of different mice, and they're all offering different features—high resolution, variable speed settings, laser, wireless, and Bluetooth. Hell, you can even buy a mouse with a fingerprint scanner built-in.

But what matters for gamers? There are a variety of mice on the market designed specifically for gamers, and they're not all created equal. Here are the criteria we use in the *Maximum PC* lab when we're testing mice.

Resolution

The resolution of the mouse has a direct impact on both the speed you turn and the level of control you have in games. As always, higher resolution is better. We recommend a mouse with a minimum of 1,600dpi these days.

With a high-resolution mouse, you can set the mouse sensitivity in-game to be relatively low, which will give you quick, even movement across the entire field of view. If you're stuck with a lower-res mouse, moving the mouse from side to side while zoomed in (to snipe, for example) could create an unpleasant stair-step effect, where the crosshair moves several pixels at a time.

Newer mice, like the Logitech MX518 and the Razer Diamondback, allow you to switch the mouse's resolution on the fly—while you're in the game. This lets you use a high sensitivity setting for driving vehicles, and a lower sensitivity setting for actions that benefit from fine movements, like sniping or flying.

Comfort

Comfort is a key criteria for any mouse purchaser, however, finding a comfortable mouse can be extremely challenging, especially for lefties. The easiest way to tell if you're going to like a mouse is to take it for a test drive. Head to your local Best Buy or CompUSA, where they'll have dozens of rodents on display for you to test out. Give yourself a few moments with each mouse, and take note of the button positions, the number of buttons, the placement of the scroll wheel, and the weight of the mouse. Most manufacturers use a similar mouse chassis for multiple mice, so you can usually get a gaming-suitable mouse in whatever chassis you prefer.

There are very few ambidextrous gaming mice on the market (the Razer Diamondback is one), so left-handed mousers will need to either mouse with their right hand, or choose a lefty-friendly mouse.

Wired or Wireless?

For games, we've got to recommend wired. Wireless has come a long way, battery life is longer, reliability is good, and most of the lag issues have been solved. However, the batteries add extra weight to the mouse, and there's nothing more frustrating than losing a heated deathmatch because your battery died.

Logitech MX518

Using a hyper-sensitive mouse can be both a blessing and a curse. Sure, having lightning-quick turn speed and pixel-perfect accuracy are great in a hot-'n'-heavy deathmatch, but when you're sniping, 1,600dpi is just too twitchy. For the best of both worlds, Logitech's MX518 lets you change the resolution on the fly using two hardwired buttons.

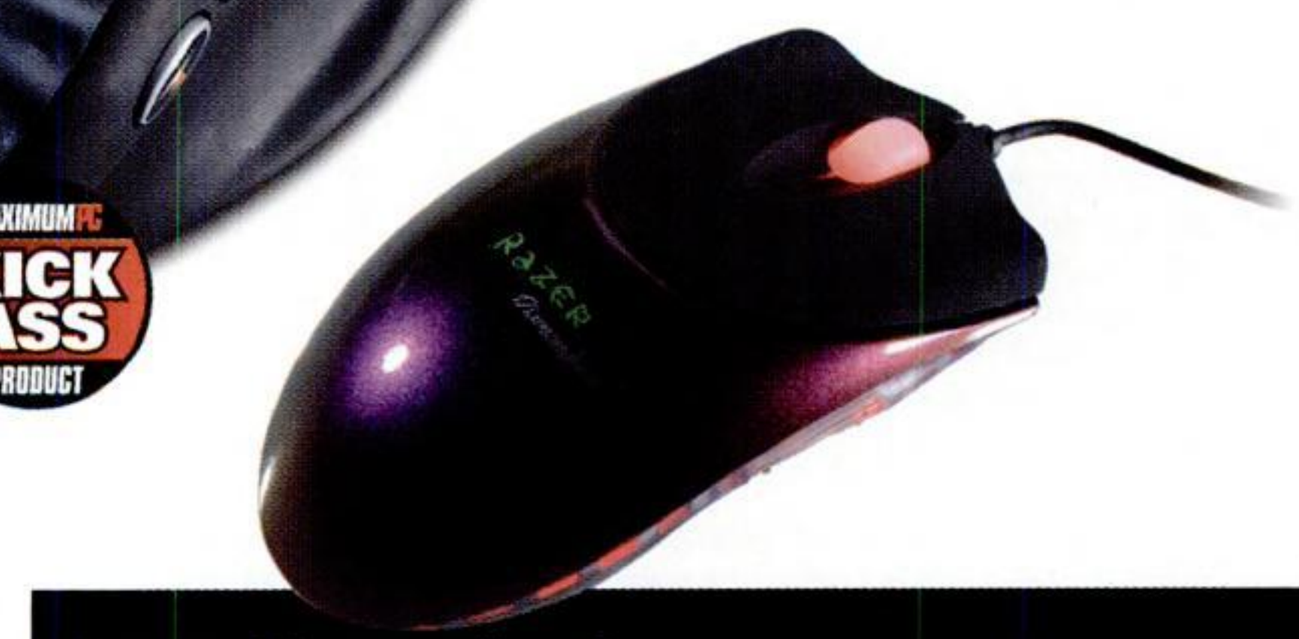
Logitech MX518

MAXIMUM PC VERDICT 9

$50, www.logitech.com

The two buttons above and below the MX518's scroll wheel control the mouse resolution. Press the button above the wheel, and the resolution goes up and the mouse speed increases. Press the button below the wheel, and the resolution goes down and you gain finer control over mouse movements. The mouse ships with three presets—400dpi, 800dpi, and 1,600dpi—that work all the time, even if you haven't installed Logitech's mouse drivers. If you install the drivers, you can reconfigure the sensitivity settings to better suit your needs.

Getting this to work in games takes a little tweaking, but the benefit is huge, especially in games that include vehicles.



Razer Diamondback

Like the MX518, the Razer mouse allows you to adjust the mouse's sensitivity on the fly. However, you have to install Razer's special drivers to get the function to work. Unfortunately, Razer's scroll-wheel sensitivity adjustment makes it really difficult to make precise changes to the Razer's sensitivity in-game.

How to Choose a Controller

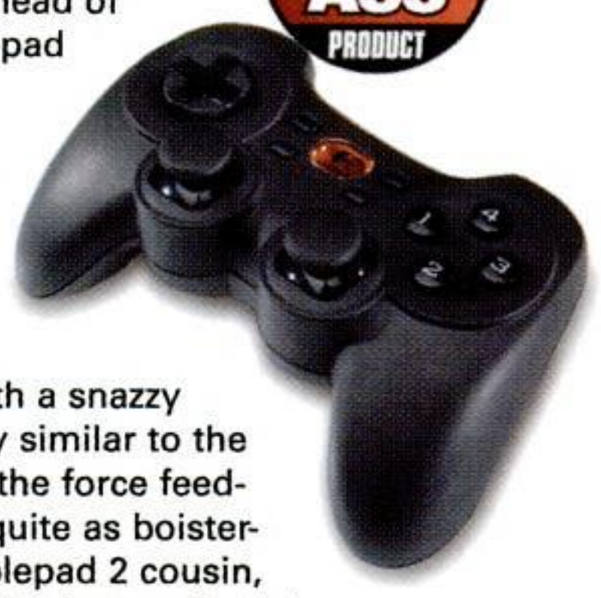
Whatever your gaming passion, there's a stick or pad out there for you...

While the keyboard and mouse combo can be extremely efficient, and marks a huge advantage for the PC as a gaming platform over the consoles, it's not well-suited for every gaming job it's pigeon-holed into. We would not wish having to play *Pacific Fighters*, *Prince of Persia*, or *SimRacing* with just a keyboard and mouse on anyone ('cept maybe that neighbor that's always stealing our newspaper). Specialized games need specialized controllers to play them.

Gamepad

Cordless Rumblepad 2

MAXIMUM PC KICK ASS PRODUCT



The consoles are light years ahead of the PC when it comes to gamepad design, and the dual-thumbstick/directional-pad combo pioneered on the PlayStation, now rules on the PC as well. Need evidence? Just take a look at our top pick for a gamepad: Logitech's Cordless Rumblepad 2. Clad in black with a snazzy red logo, this 'pad is extremely similar to the PS2's default controller. While the force feedback "rumble" response isn't quite as boisterous as that of its corded Rumblepad 2 cousin, that's to be expected in a dual AA battery-fueled wireless pad. (Expect 50 to 100 hours of gaming out of each set.) You'll forget about this when you fail to notice any of the lag penalties normally associated with using a wireless pad—even when you're 10 feet away from your PC.

Logitech Cordless Rumblepad 2
MAXIMUM PC VERDICT **10**
$40, www.logitech.com

Joystick: Casual

Cyborg Evo Force

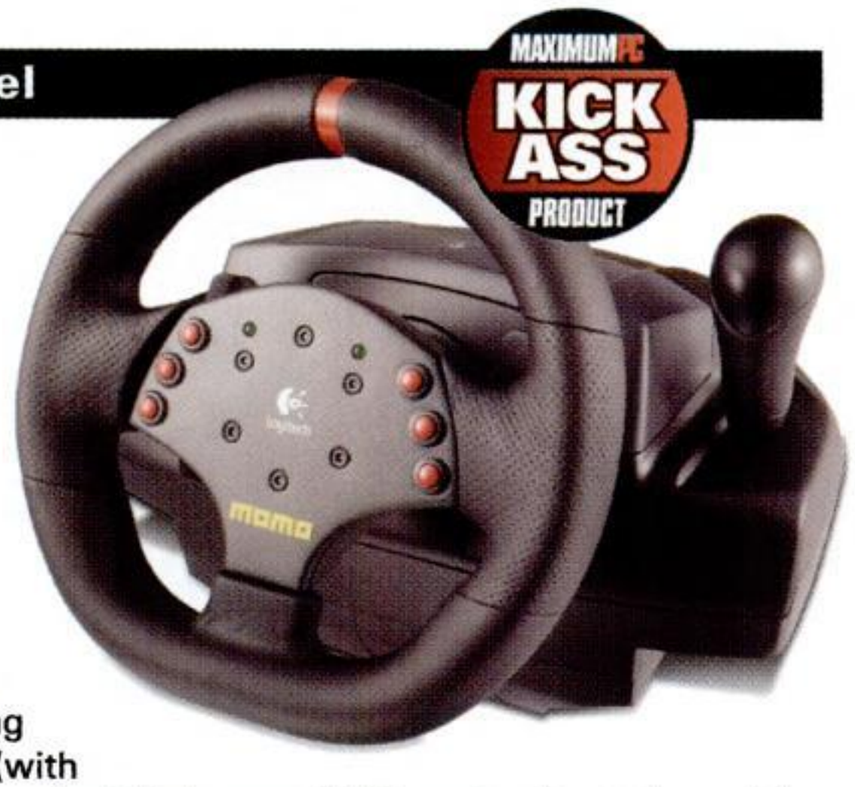
With top-notch force-feedback effects, rudder twist, plenty of programmable buttons, a stylish look, and a very fair price, Saitek's digital Cyborg Evo Force stick has it all. Heck, you can even customize the stick for right or left-handed use! With Microsoft bowing out of the market and taking its excellent SideWinder stick with it, the Evo Force is where it's at for an all-around generic 'stick. (The Evo is also offered in non-FF wired and wireless versions.)

Saitek Cyborg Evo Force
MAXIMUM PC VERDICT **8**
$70, www.saitekusa.com

Racing Wheel

Logitech MOMO Racing

MAXIMUM PC KICK ASS PRODUCT

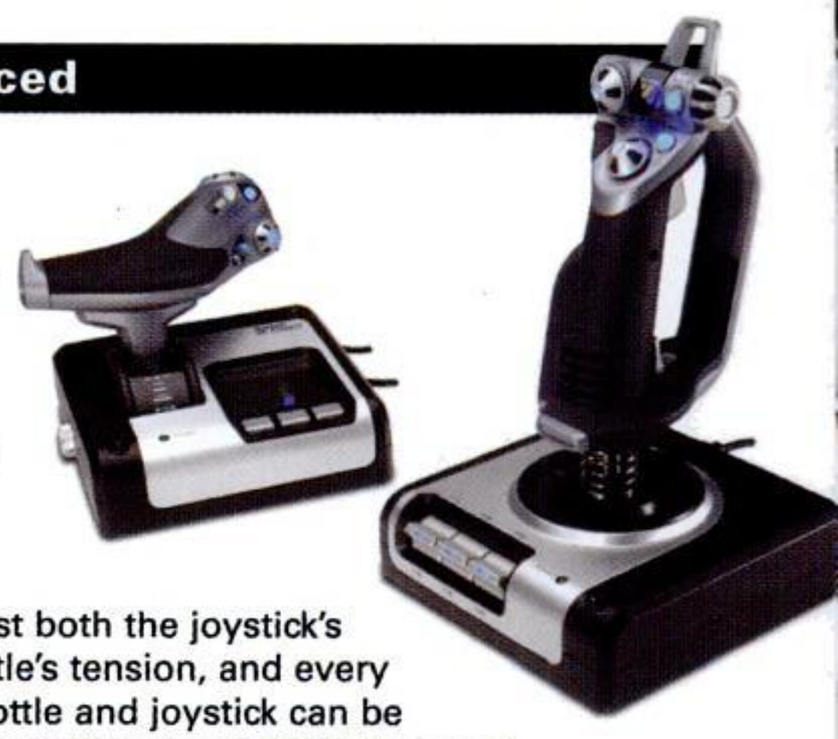


You've not truly experienced EA's NASCAR *SimRacing*—or any other racing game, for that matter—until you've plugged a steering wheel controller (with gas/brake/clutch controls) into your USB port and put the pedal to the metal. With sturdy, comfortable construction, excellent force-feedback effects, and remarkable ease of setup and use, Logitech's MOMO Racing wheel is our choice for top racing dawg honors. This full-rubber wheel comes with dual paddle shifters, six programmable buttons, gas and brake pedals, and a stick shift.

Logitech MOMO Racing
MAXIMUM PC VERDICT **9**
$100, www.logitech.com

Joystick: Advanced

Saitek X-52



If you're going to play any flight sim, a hands-on-throttle-and-stick (HOTAS) combo is a must. Saitek's X-52 is the most capable we've ever seen at this price point, and it's also the most flexible.

You can quickly adjust both the joystick's hand rest and the throttle's tension, and every button on both the throttle and joystick can be programmed relatively easily using Saitek's included Smart Technology (SST) software.

A fancy-pants LED multifunction display adorning the throttle tells you which mode the X-52 is in, as well as the name of the command assigned to a given button once the button is activated. The throttle also houses a thumb-stick mouse controller, which is handy for in-game camera and navigation control.

The X-52 also offers adequate rudder controls on the stick (left/right twist). If you don't like to twist, the device will work with third-party USB rudder controls, such as CH Products' Pro Pedals USB.

We'd like better documentation, but the X-52's price, features, and flexibility make it a solid choice for budding Top Guns. If your tastes run a bit higher, you can't go wrong with CH Products' infamous flightstick, throttle, and rudder trio—the Fighterstick USB, Pro Throttle USB, and Pro Pedals USB (MSRP: $149 each).

Saitek X-52
MAXIMUM PC VERDICT **9**
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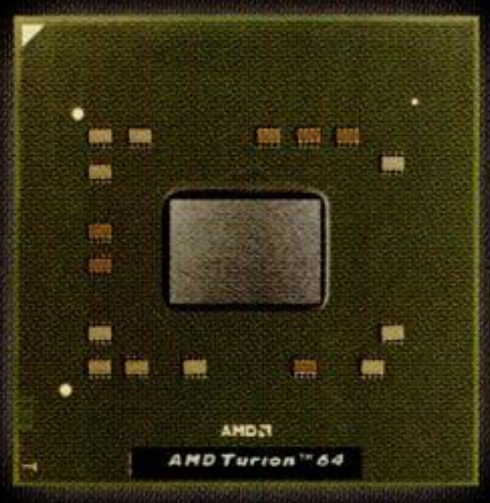
How to Choose a Laptop

Everything you need to know about gaming on the go

To get the most for your notebook dollar, you need to know which parts are worth the bucks and which parts won't pay off in a performance notebook. Here's a quick guide to spec'ing out your notebook.

CPU: Intel's Pentium M—aka Centrino—is downright fast while being incredibly easy on the battery. It's the exact same CPU you get in a "Centrino" notebook. Intel only allows system vendors to use the "Centrino" name when they buy the CPU, the core logic chipset, and a wireless chipset from Intel. Notebooks that don't, for example, have an Intel wireless chip (which is the part most commonly left out) can only be called Pentium M.



AMD's answer to the Centrino is the Athlon 64-based Turion, which promises comparable battery life and good performance.

AMD's Mobile Athlon 64 is a competent alternative to the mobile Pentium family, but the recently released Turion processor is claimed to be as power-conscious as Centrino while offering support for 64-bit OSes. Until we see the numbers, though, we'd put our money on the Pentium M, which is a proven performer.

Intel's desktop Pentium 4 chip is another option. However, their battery life is measured in minutes, and they get very hot—too hot to use on your lap, in fact.

RAM: In notebooks, DDR2 memory has one advantage over DDR: power savings. DDR2's lower 1.8 voltage means that 1GB of DDR2 RAM will use less power than 1GB of DDR RAM. We still recommend 1GB as the minimum amount of RAM.

Graphics: More than the CPU, more than the RAM (once you have 1GB, anyway) and more than the hard drive, the GPU is where it's at. Today the new Mobility Radeon X800 XT Platinum Edition has the edge in gaming: Its 16-pipe design is nearly on par with the fastest desktop parts (SLI notwithstanding). Usually 16-pipes beat 12, but there is another tack vendors have taken, which is to use a cooler-running CPU and apply those thermal savings to the GPU. This way, the vendors can get damn near the performance of a 16-pipe part using a 12-pipe part (such as the Geforce GO 6800 Dell uses in the XPS, pictured) by cranking the clocks up.

Screen: Whether you call it ClearView or TrueLife, skipping the anti-glare coating is the hottest trend in notebooks today. The shiny screens give movies and games extra depth and gloss: unfortunately, these screens are also highly reflective. If this matters to you, stick with the anti-reflective coating.

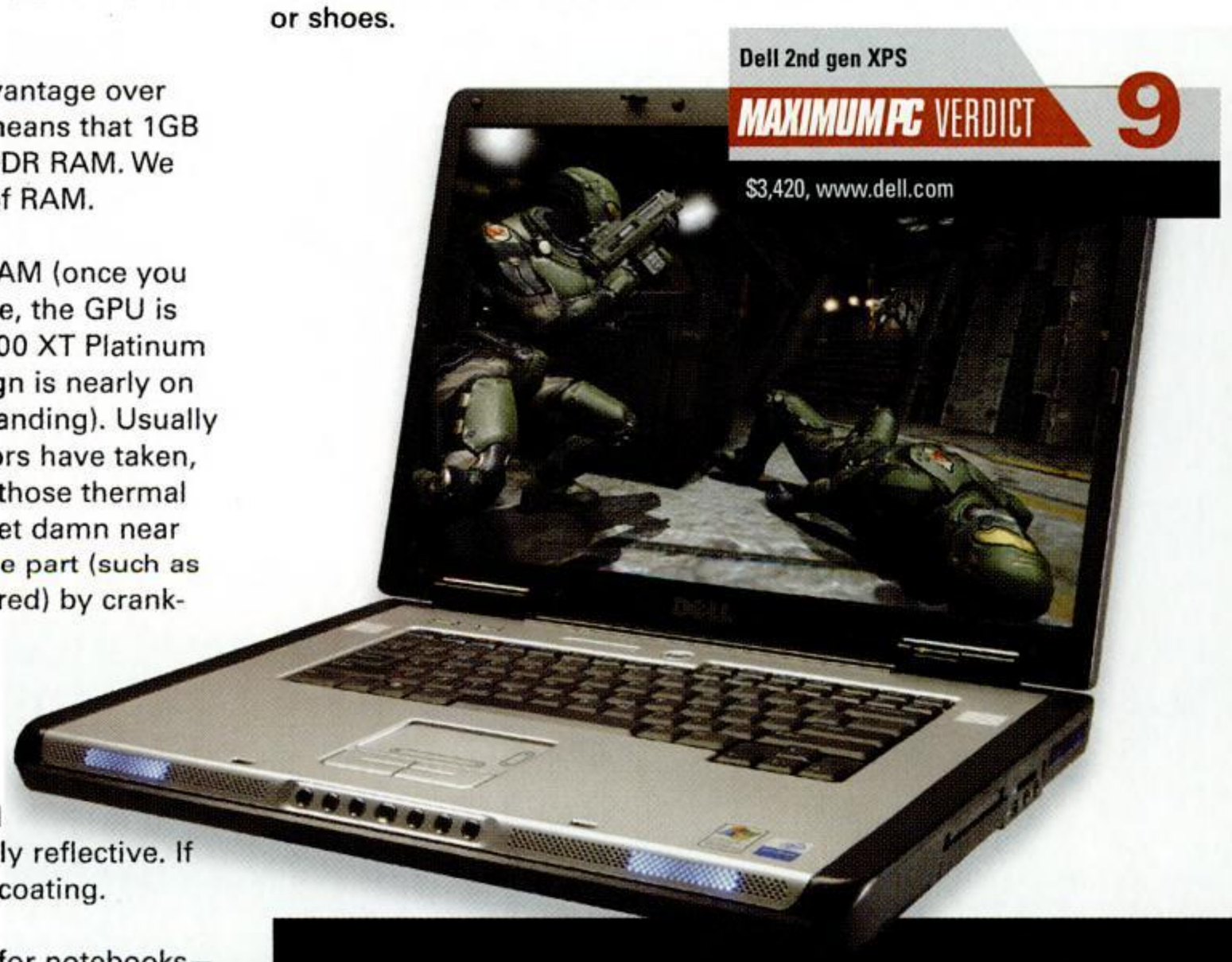
Wireless: Today 802.11g is the standard bearer for notebooks—802.11b is the bare minimum. And, unless you're planning on using your notebook in a corporate environment that runs 802.11a, there's probably no real reason to have it. Bluetooth is nifty if you have a Bluetooth phone, but otherwise, it's not a must-have.

Expansion cards: The 32-bit CardBus PC Card (aka PCMCIA) is ready to be decommissioned in favor of ExpressCard peripherals. Although ExpressCard offers more than twice the bandwidth of CardBus, its adoption rate is molasses slow. Few notebooks actually need the massive input/output bandwidth ExpressCard offers, thanks to the integration of demanding components, so it's not a make-or-break deal at this point.

Storage: For performance, the 7,200rpm hard drives are where it's at—but they drain your battery and generate heat. Therefore, the 5,400rpm drive makes a whole lot of sense, but we'd say this is one area where it may be worth having the spindle speed. While other areas of notebook components are closing the gap with desktops, hard drives aren't close. If we wanted both spindle speed and density, we'd go with Seagate's Momentus 7200.1, which gives you 100GB of capacity *and* 7,200rpm in one drive.

Today, just like on the desktop, you want nothing less than an optical drive that burns both + and – DVD formats as well as double-layer DVDs (with CD-Rs being a given). The minimum is 8x for the write-once discs.

Input: Joystick or track pad? It's about as personal a decision as picking out condoms or shoes. But one thing's for certain: don't assume they're the same. If you're a track-pad person, it's not safe to assume a Think Pad's pad will be the same as a Dell Inspiron's. The only way to really find out which you prefer is to try before you buy, which we don't recommend with condoms or shoes.



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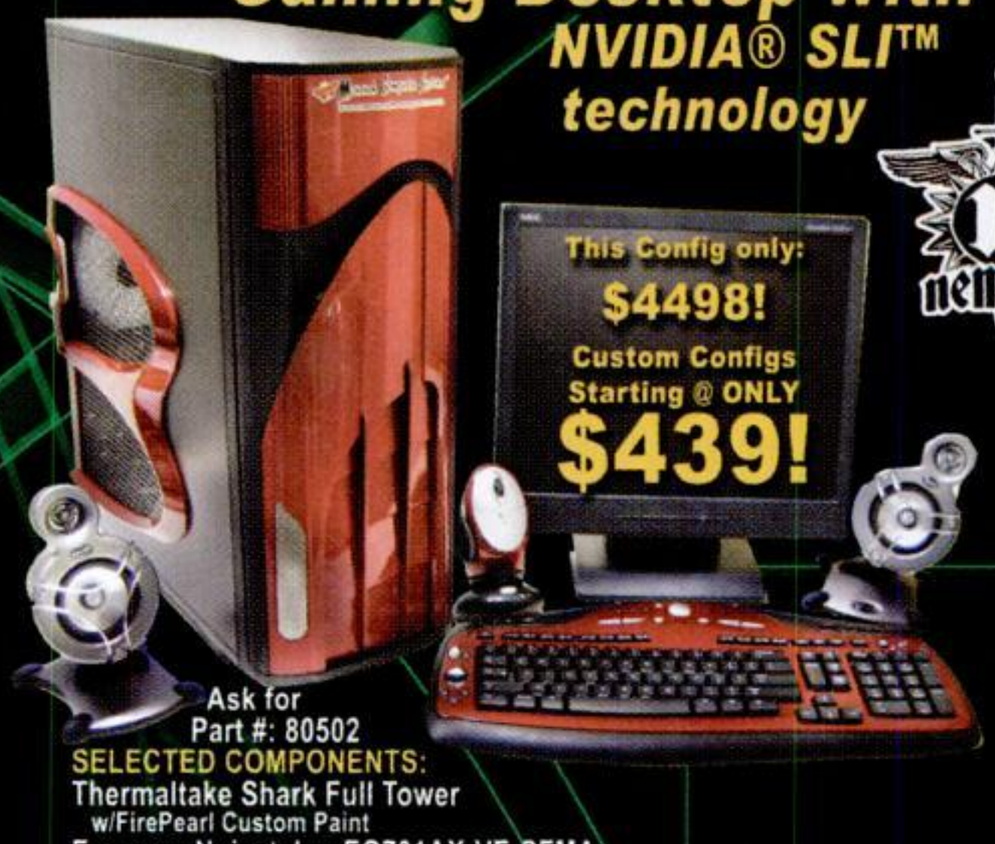

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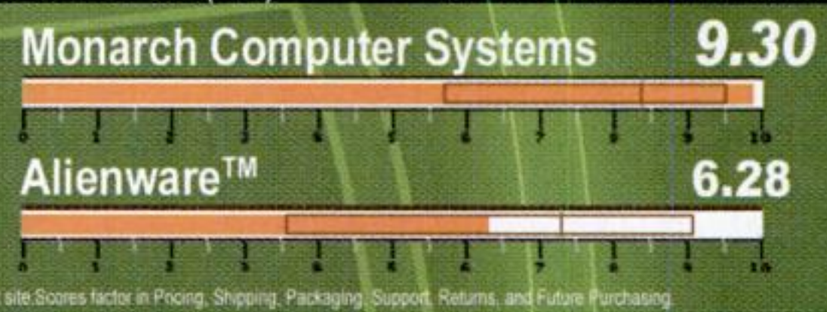

*The data used for this graph was collected from ResellerRatings.com in March 2005. Scores noted here represent scores for Overall Customer Service as determined by that site.Scores factor in Pricing, Shipping, Packaging, Support, Returns, and Future Purchasing.

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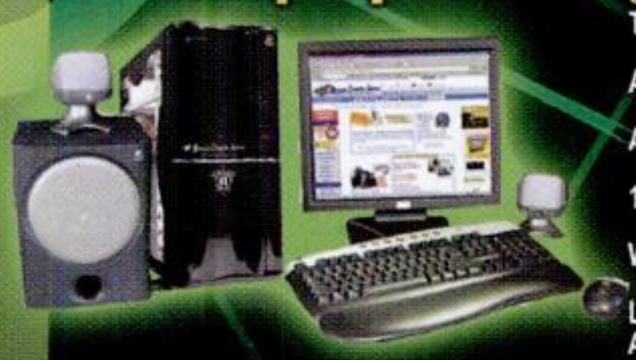

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How to Buy a System

If the price looks too good to be true... it probably is

If your last homebrew PC turned into a disaster epic of Irwin Allen proportions, perhaps you're better suited as a buyer rather than a builder. And there's no need to hang your head in shame. Buying a PC can be preferable, particularly compared to a machine built by your 13-year-old neighbor. For one, there's a warranty—something most PCs assembled from swap-meet parts don't have.

And, depending on the vendor, pre-built PCs should also have been tested for hardware compatibility as well as thermal and acoustics issues. Think of that the next time you have to pull off your PC's side door to keep it cool during the summer or you find that your box sounds like a jet taking off. Not all PC makers are the same, though. Here are a few tips to help you select your next off-the-shelf PC.

Warranty

As we mentioned, one of the perks of buying a system is the warranty, but is your warranty all that? Some companies, for example, will void your warranty for over-clocking. If you plan on over-clocking a pre-built box, make sure the company won't toss your warranty for the dark art. Also, what does "lifetime" warranty mean: the life of the company, the original owner, or the life of the product (which really means three years)? Of course, the warranty is only as good as the company that prints it. Some PC builders won't be here in three years and some will be here in 13 years. (Be wary of builders whose names you don't recognize and that offer rock-bottom prices.) These are all question to ask your system builder before clicking the "pay" button.

The OS Disc

We prefer to receive the full OS disc with a new machine instead of system-restore discs. Restore discs are great if you need to burn your virus-infected OS to the ground and have another, pristine OS up and running in 15 minutes. However, they're not so great down the road because most OS restore discs are tied to the motherboard. If you replace the motherboard in your PC in the year 2007, your restore disc will do you no good. We like to believe that the OS is tied to the PC and the motherboard is no different than replacing a keyboard. A generic Windows OS disc will let you replace your mobo without having to pay another $150 for the OS. So when ordering your system, ask if you get a hologram Windows XP disc with the system.

Proprietary Components

When people think proprietary, they think of the horrid days of yore when system vendors relied heavily on proprietary components—even going so far as to require you use their custom RAM. We've come a long way, but proprietary parts still exist. Today, Dell is probably the number-one culprit. Its power supplies and motherboards, for example, can't easily be exchanged with off-the-shelf parts. Of course, Dell says that's better: The company says its proprietary parts are so well-engineered that they're actually better than off-the-shelf parts. Be that as it may, you still won't be able to swap out the mobo in a Dell XPS with a new one from Fry's in three years when you might want to. We recommend sticking with off-the-shelf components that follow industry specifications. Of course, Dell—and other vendors that use proprietary parts—do make one good argument: In four years, the PC will be so radically different, more powerful, and more affordable that you'll hardly want to get all greased up trying to upgrade parts. Point taken, but we generally want to replace a part or two—or three—after a mere 12 months or so. So we recommend that you try to stick with off-the-shelf parts, too. Options are good!

OEM Parts

Here's a little nasty secret we've seen pulled off over the years. Magazines and tech web sites review a videocard that's clocked at 500MHz. OEMs get a videocard with the same name but it's clocked down to 400MHz. Who's lying? No one, really. Hardware makers often give PC manufacturers parts that can be slightly different from the full "retail" parts. Everything from slower clock speeds, different chip spins, more conservative firmware, and even missing features can be found in some "OEM" parts. If there's an important part going into the machine that you're ordering, make sure the one you're getting is the same as the one you want. If you're looking for a 24-pipe GeForce 7800GTX or a hard drive with 16MB of cache, make sure the part has those features. While this is something to be careful of, don't always assume what you're getting is a rip-off. We recently discovered that one OEM was able to get hard drives with NCQ support that can't be found in the products' retail counterparts.

The Bling

You'd be hard pressed to find the difference between an Athlon 64 FX-57 from vendor A and vendor B when you look inside your PC. However, you'll find dramatic differences outside of the case. Some vendors offer custom-painted cases that would look at home at a car show. Others feature custom-designed and -built case enclosures that you can't find anywhere else. Then there's all sorts of UV lighting, LEDs (even on RAM), and even glow-in-the-dark parts. Make sure you don't get taken in by all this "bling" and pay more for the looks than the guts of your new PC. The bright side: If the case is highly customized, or is one you can't buy anywhere else, it's a sign that you're dealing with a legit company with some staying power.

Customer Service

If the company you're buying from won't even email you back to give you a quote on a new computer, you can probably guess that any other dealings with the company will only get worse. If the PC

Your New PC

For today's—and tomorrow's—games, your new PC should at least meet the following criteria:

- ✔ *An Athlon 64/FX-class processor or a 2MB cache Pentium 4 CPU*
- ✔ *1GB minimum of either DDR400 (for Athlon 64) or DDR2/667 (for P4)*
- ✔ *A GeForce 7800 GTX- or an ATI X850-class videocard with 256MB of RAM.*
- ✔ *A motherboard that supports either ATI's CrossFire (when it's available) or nVidia's SLI and dual-core processors.*
- ✔ *Creative Sound Blaster Audigy 2 ZS, on-board Intel HD audio or Sound Blaster X-Fi (when available)*
- ✔ *A 16x dual-layer DVD burner such as Plextor's PX-716A*
- ✔ *A minimum of 250GB hard drive such as Maxtor's DiamondMax Plus 250 or a Hitachi 7K250.*
- ✔ *Optional: A second drive such as Western Digital's 10,000rpm Raptor.*

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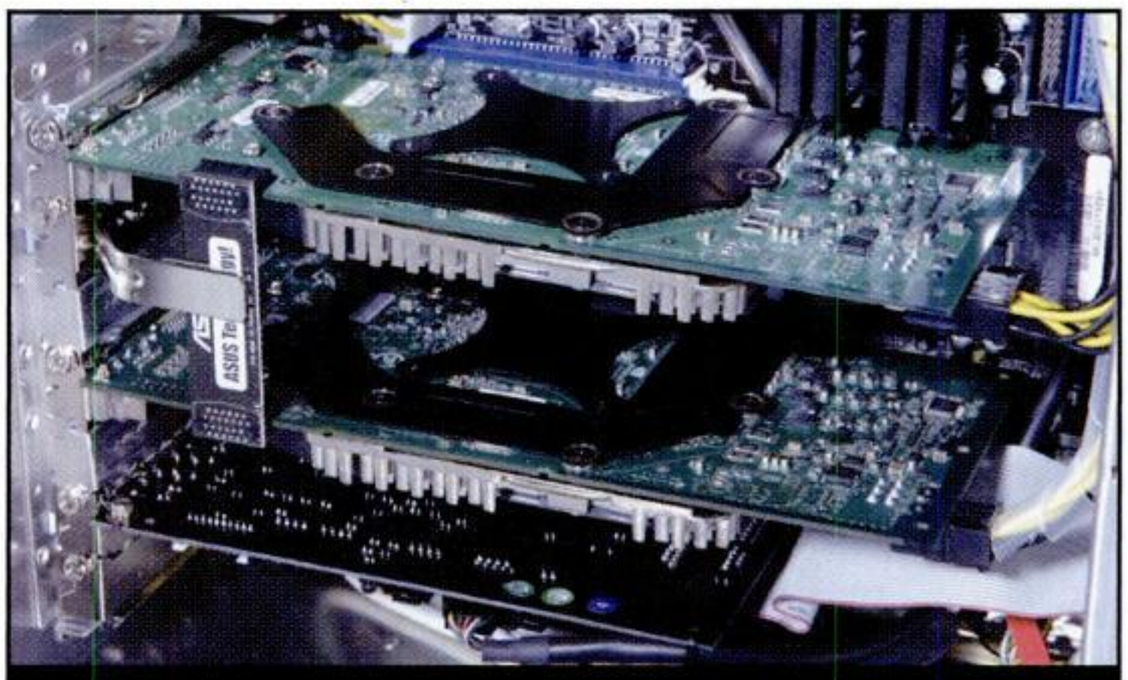
company you're shopping at treats you with less respect than you like, or doesn't answer your technical questions satisfactorily, just shop elsewhere—you can always find another good deal.

Tech Support

It's difficult for anyone to truly judge a PC company's technical support. If you experience a busy signal or you're put on hold for 20 minutes on a Monday morning, will you face the same wait if you call back Wednesday afternoon? Still, there are a few basic questions you must answer before you buy. First, does the company offer a toll-free line for support? Some companies offer toll-free lines to *buy* your PC but toll lines when *they* have to fix it. Not good. Are the support hours reasonable and are they on days when you can call, or will you be calling during your lunch break at work? Does the company offer online-only technical support? Larger companies tend to push customers to online support forums and FAQs to solve problems, while smaller companies tend to rely on their techs. Both have their strengths and weaknesses. Real technicians can sometimes troubleshoot your problems far faster and more effectively than online support. But, that assumes you're talking to the A team. If you get the D team, you're in for some pain. Huge mega-companies push you to online support because, well, it's cheaper for them. But the online support is probably more uniform than hoping to get the A-team tech from the smaller company. The



If you don't have the scratch to spring for an SLI videocard setup, at least make sure your new system will support it later.

larger companies may also have the cash to develop their own applications for troubleshooting your problem. It's very much a personal choice. If we had our choice, we'd take the A-team technician over the web wizard. At some of the smaller companies, it's actually the guys who built the machine that you talk to so, that can be an advantage as well.

System Review

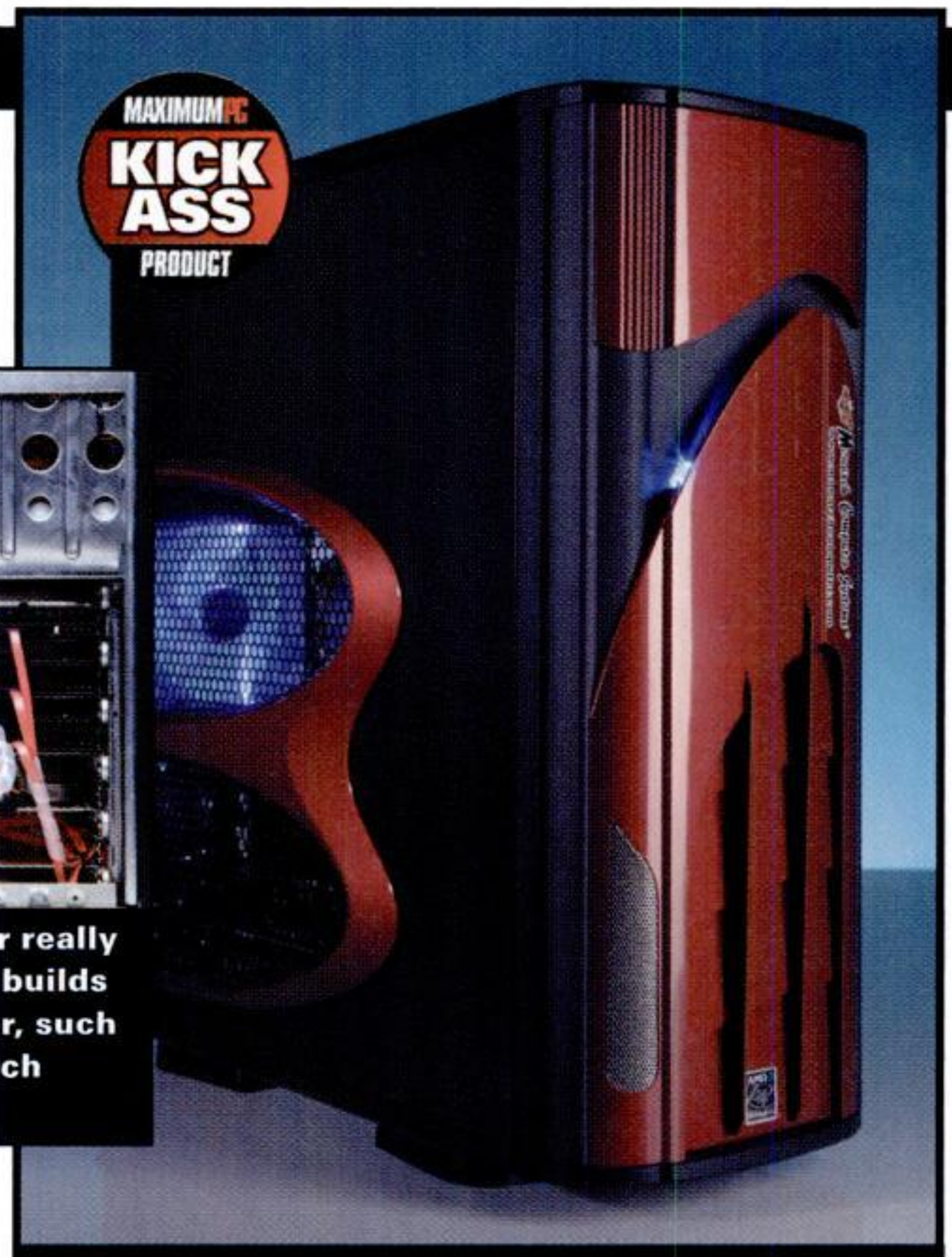
Monarch Nemesis

Best known for its small-formfactor machines, Monarch is serving notice that it's a player when it comes to full-size machines, too. The Nemesis, which happens to be the first computer outfitted with AMD's Athlon FX-57 CPU to roll into our Lab, is a gaming beast.

The FX-57 represents a move to AMD's 90nm "San Diego" CPU core, and it boasts a clock-speed bump from 2.6GHz to 2.8GHz, support for SSE3 instructions, and a tweaked on-die memory controller. But the FX-57 isn't the only new part occupying the roomy confines of the custom-painted Thermaltake Shark case: Monarch has plugged in two brand-spanking-new nVidia GeForce 7800 GTX videocards in SLI—another first for us (aside from those in the Dream Machine, of course). Each of these wonder twins features a core clock speed of 430MHz and 256MB of GDDR3 RAM clocked at 600MHz.

Monarch chose Asus' solid-as-a-rock A8N-SLI Premium motherboard (nForce4 chipset) and plugged in 2GB of Corsair DDR400 RAM, a Creative Labs Audigy 2 ZS Platinum soundcard, and a Plextor PX-716SA DVD+/-RW optical drive. Storage duties are ably handled by a 75GB Western Digital Raptor, plus a pair of 250GB WD SATA drives in a RAID 0 configuration.

The first sign that a builder really gives a hoot about what it builds is a sparkling-clean interior, such as that found in the Monarch Nemesis.



The Monarch Nemesis is a tour de force of next-gen AMD and nVidia hardware.

To no one's surprise, the Nemesis chewed through our benchmarks like Dom DeLuise tearing his way through a Sizzler's all-you-can-eat buffet. The Nemesis netted 100-plus-percent improvement over our zero-point system in our 3DMark05 Game 3 test, turning in a mind-blowing 59fps. The Nemesis' *Doom 3* score of 94.3fps was impressive enough that we decided to up the detail settings to Ultra—where we saw a drop of just five frames per second. SYSmark2004 performance was equally great, netting a solid 227. That's not the highest score we've ever seen, but it does beat all the FX-55 systems we've seen to date. Monarch throws in a software bundle consisting of *Half-Life 2*, the 64-bit edition of *Far Cry*, and *Lego Star Wars*, making the Nemesis ready to rock right out of the box.

The Nemesis is proof that single-core machines can still exhibit some superiority over the up-and-coming dual-cores (including our very own Dream Machine).

Monarch Nemesis

MAXIMUM PC VERDICT 9

$4,325, www.monarchsystems.com

Build Your PC

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The Right Way

Got a Phillips-head screwdriver? Good. It's all you need to build a custom rig. Well, that, a few hours, and our expert 21-point guide to building a computer—the right way. The *Maximum PC* way.

BY WILL SMITH

We're going to say this one more time, for good measure. If you own a Phillips-head screwdriver, you can build your own PC. And, frankly, you'd be a fool not to. Custom-building a computer is one of the great spirit quests of our time—it separates the men from the boys, the hardcore from the mainstream, the *Maximum PC* readers from the readers of... um, lesser PC magazines. You call yourself a power user? We say, *prove it, buddy.* Step up to the plate and BYO—Build. Your. Own.

The reality is that building your own PC is actually simpler than assembling a bicycle or a piece of Ikea furniture. But that's not to say the process is free of potential pitfalls. If you want to build a machine using the latest cutting-edge hardware, there's a lot you need to know before you begin. Improperly inserting an LGA775 processor can destroy your CPU, your motherboard, or both! To avoid such a tragedy, we're going to show you how to build your PC the right way. The only way. The *Maximum PC* way.

Inside this epic tale of PC building gone good, you will find:

✔ **A LAUNDRY LIST** detailing each and every component you need—for PCs of three different price-ranges. Each configuration is *Maximum PC*-certified, meaning our Lab experts hand-built it and guarantee it will work.

✔ **A SHORT CHECKLIST** detailing each and every step you need in order to build your system. Clip it and save it for later!

✔ **A CUT-OUT QUICK REFERENCE** that allows you to record your PC's most vital information.

✔ **A COMPREHENSIVE 9-PAGE WALK-THROUGH** where we show you every single step necessary to assemble your PC, get Windows running, and troubleshoot any problems you encounter along the way.

Oh, one more thing before we begin: static electricity. In short, it can kill sensitive computer components like CPUs and videocards, so it's important you ground yourself, which prevents static buildup from occurring between you and your case. Simply touch a metal portion of the case before you pick up any of your components, and you'll be just fine.

Now clear off a nice big workspace (the den will do nicely) and let's get started!

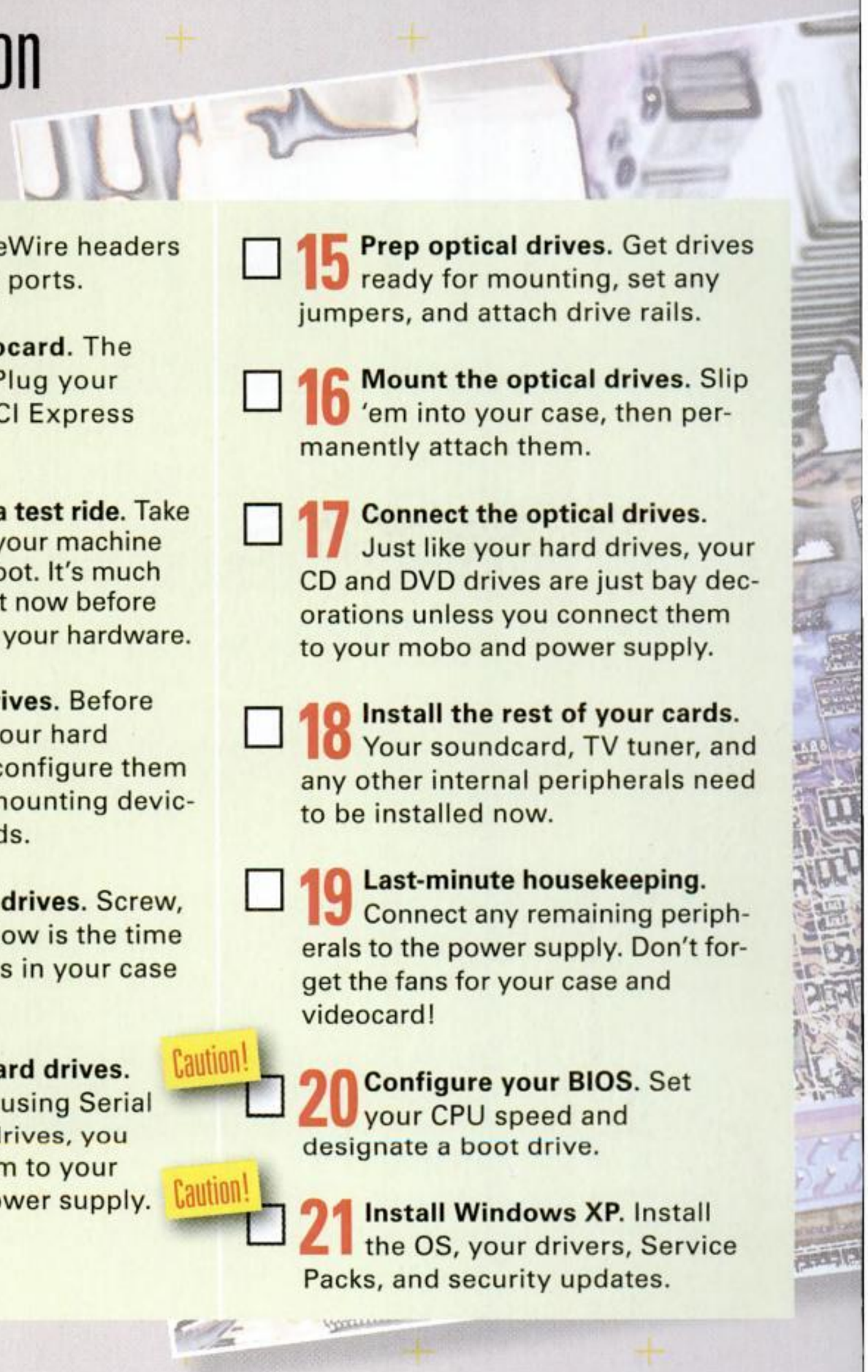
WARNING!

Think you're an expert? Think again. Some of the new hardware we're going to discuss can be delicate and requires special care to install. Read our guide *now* or risk destroying your expensive hardware!

Build It!

Build It Checklist: The Short, Short Version

Use this step-by-step list anytime you build a PC



- ☐ **1 Prep your case.** Get your case ready before you get started.
- ☐ **2 Add power.** If your case didn't come with a power supply, install the PSU now.

Caution!

- ☐ **3 Prep your mobo.** Screw the motherboard mounts into your case.
- ☐ **4 Install the backplate.** It's important to install the proper ATX backplate for your mobo into your case.
- ☐ **5 Mount the mobo.** Hey, it's easier said than done.

Caution!

- ☐ **6 Socket your processor.** Install your CPU. Take your time—a faulty install can fry your processor!
- ☐ **7 Add the memory.** Install your RAM modules.
- ☐ **8 Arm the switches.** Connect the case switches and lights to your motherboard.

Caution!

- ☐ **9 Power external peripherals.** If your case and mobo have them, now is the time to connect your internal USB and FireWire headers to the case-mounted ports.
- ☐ **10 Install the videocard.** The title says it all. Plug your videocard into its PCI Express or AGP slot.
- ☐ **11 Take your rig for a test ride.** Take a minute to plug your machine in and give it a test boot. It's much easier to troubleshoot now before you install the rest of your hardware.
- ☐ **12 Prep the hard drives.** Before you can install your hard drives, you need to configure them and affix whatever mounting devices your case demands.
- ☐ **13 Mount the hard drives.** Screw, slide, or hook. Now is the time to put the hard drives in your case enclosure.

Caution!

- ☐ **14 Connect your hard drives.** Whether you're using Serial ATA or parallel IDE drives, you need to connect them to your motherboard and power supply.
- ☐ **15 Prep optical drives.** Get drives ready for mounting, set any jumpers, and attach drive rails.
- ☐ **16 Mount the optical drives.** Slip 'em into your case, then permanently attach them.
- ☐ **17 Connect the optical drives.** Just like your hard drives, your CD and DVD drives are just bay decorations unless you connect them to your mobo and power supply.
- ☐ **18 Install the rest of your cards.** Your soundcard, TV tuner, and any other internal peripherals need to be installed now.
- ☐ **19 Last-minute housekeeping.** Connect any remaining peripherals to the power supply. Don't forget the fans for your case and videocard!

Caution!

- ☐ **20 Configure your BIOS.** Set your CPU speed and designate a boot drive.

Caution!

- ☐ **21 Install Windows XP.** Install the OS, your drivers, Service Packs, and security updates.

Quick Reference: Crucial Information

There are some names and numbers you absolutely must have when you configure a new machine, and it helps to have them handy. Here's our list—clip this out and tape it to the inside of your case.

MOTHERBOARD MODEL:

CPU SPEED:

VIDEOCARD MODEL:

WINDOWS XP SERIAL KEY:

DIAL-UP INFORMATION (OR PPPOE LOGIN):

DIAL-UP NUMBER:

USERNAME/PASSWORD HINT:

TECH SUPPORT PHONE NUMBER:

NETWORK INFO:

WIRELESS NETWORK NAME:

WIRELESS NETWORK WEP KEY:

STATIC IP ADDRESS:

DNS ADDRESS:

SUBNET MASK:

GATEWAY:

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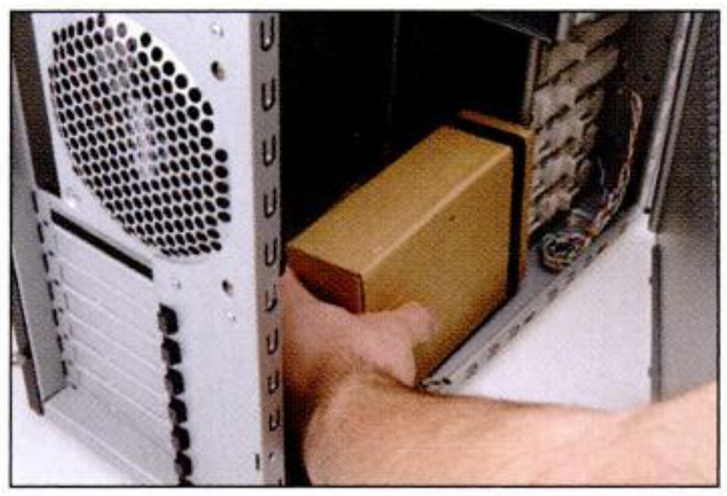
Build Your PC!

You've got your parts, you've got your screwdriver. Now it's time to grab a tasty beverage, situate yourself in a static-free area, and get started!

Step 1: Prep your case



Most PC cases come with a fair amount of hardware. Everything from specialized standoff mounts that will keep your mobo at just the right height, to front-mounted USB ports, to the proper screws for mounting fans, should be in a box inside your case. Before we can get started, you'll need to remove your case door and pull out that box of hardware. Got it? Great!

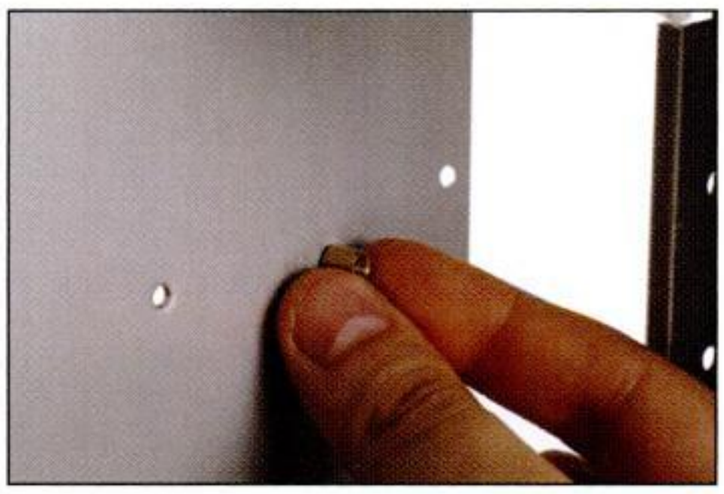
Since you're going to lay the case down on its side to work, it's a good idea to take off both side panels. Taking off the case doors prevents you from scratching them while you install the rest of your gear.

Step 2: Add power

If your case doesn't come with a power supply, you need to install the one you bought. Usually, there's some sort of mounting bracket screwed into the back of the case. You need to unscrew the bracket before you can mount the power supply to it. Make sure you pay attention to the way the bracket was on the case before you removed it. The entire assembly only goes on one way. If you flip the bracket over, it just won't mount properly.

Once the PSU is attached to the bracket, slide the power supply into your case and screw the bracket down.

Step 3: Prep your mobo



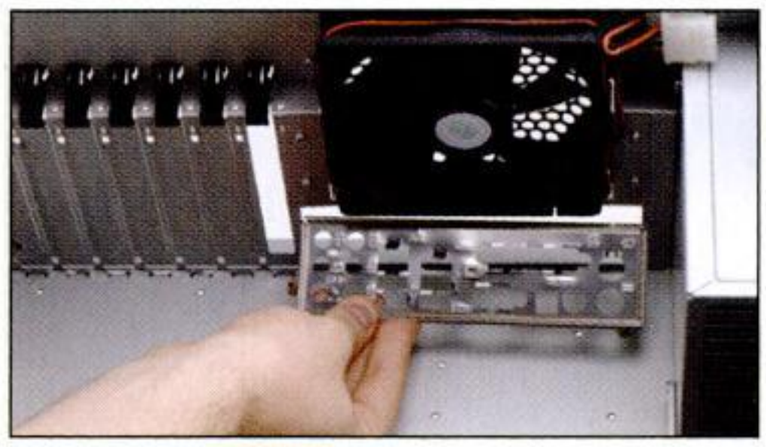
In order to mount your motherboard in the case, you need to first install motherboard standoffs. (If your case has a motherboard tray, you'll have a much easier time if you remove the tray from your case.) Each motherboard has a slightly different standoff config, so hold the mobo up to the tray and note which holes on your mobo line up with the holes on the tray.

It's vital that you not put extra standoffs in the case that don't align with holes on the mobo. The extra standoffs can short contacts on the back of the mobo, and render your whole system unbootable—or cause permanent damage to your hardware.

Caution! ***"It's vital that you not put extra standoffs in the case that won't align with holes on the mobo."***

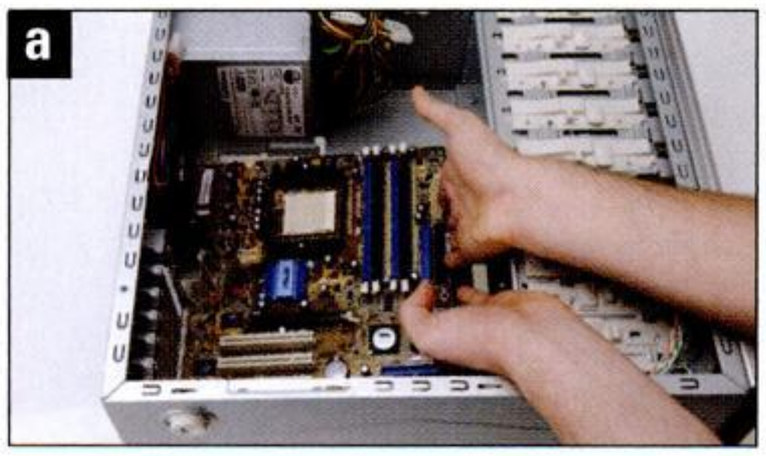
Step 4: Install the backplate

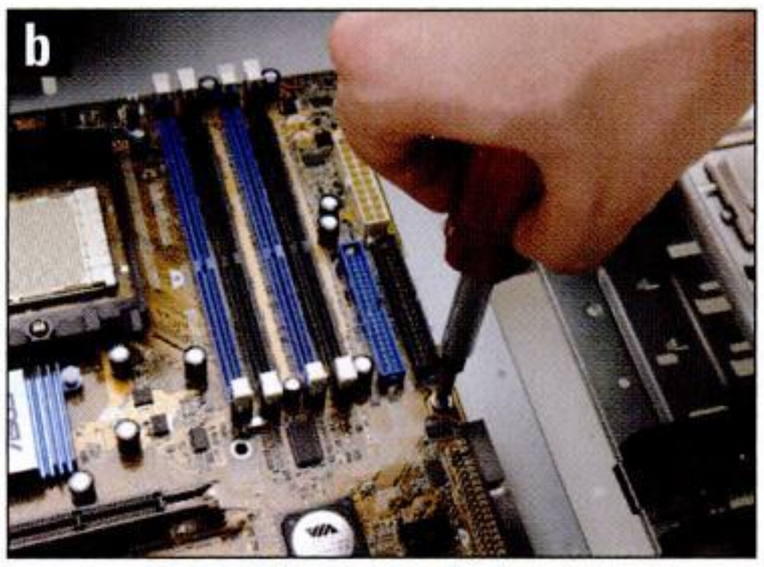
Because there are dozens of possible configurations for the ATX backplate—the thing on your mobo with holes for the PS/2, USB, serial, parallel, network, and even FireWire connectors—each motherboard comes with a custom plate, which pops into a standard-size hole in your case. It mounts from the inside, so you'll need to line it up with the hole and pop it into place. Make sure that it faces the right way. Usually the PS/2 ports go nearest the power supply.



Step 5: Mount the mobo

To mount the mobo, line up its rear connectors—the PS/2, USB, and other ports—with the holes in your ATX backplate, and slide the mobo into the case at a 45-degree angle **(a)**. Once the port connectors have lined up with the backplate, lower the front edge of the mobo. Once that's done, screw down the mobo **(b)**. Be careful not to strip the screws. A good practice is to reverse each screw one quarter of a turn before you begin screwing it down.





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Build It!

Maximum PC–Approved: A PC for Any Budget

Is it possible to build a kickass gaming rig for today's games that's not disposable tomorrow? Hell yes, and for much less than you'd think!

Most off-the-shelf PCs from the likes of Dell and Alienware that we'd consider "game-worthy" will set you back a minimum of $2,000. If you're looking for a gaming rig and are faced with a strict budget, you're better off building your own—you'll get a lot more gaming bang for your buck. And building a PC's not as hard as you might think. (As our guide will show you.)

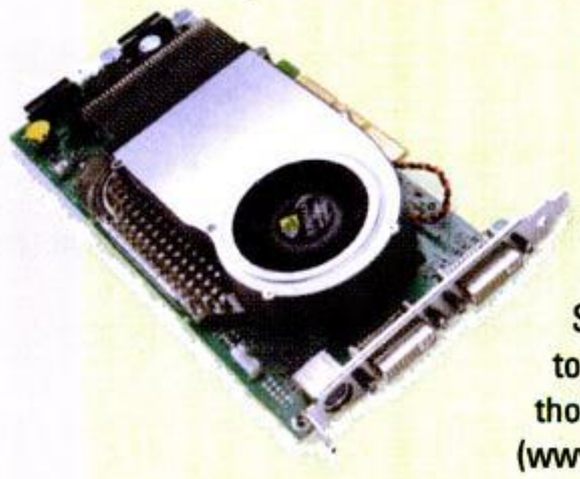
We've assembled a parts list for you with all the components we'd recommend for the ultimate gaming "lean machine." Our sub-$2,000 machine is fast, and it's remarkably future-proofed. Not only will you be able to add a second videocard later in an SLI configuration, but you'll also be able to go the dual-core processor route, too.

CPU: Athlon 64 3000+

Our budget machine can run 64-bit OSes and even has SSE3 to boot, thanks to its 90nm shrink of the famous Athlon 64 core. By selecting the Socket 939 version, we get dual-channel RAM and a much richer upgrade path. (www.amd.com; $149)

Plextor PX-716A

This Sexy Plexy gives us dual-layer burns at 6x and single-layer speeds at 16x. With 48x CD-R burns, you don't need much else. (www.plextor.com; $115)



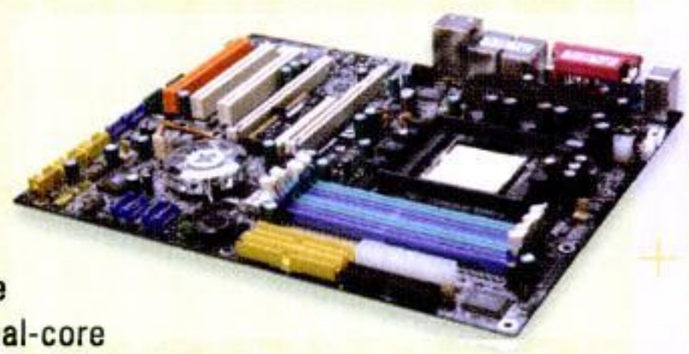
Video Card: nVidia GeForce 6800GT

Remember when SLI was talked about in bated breath? Today, we can have an SLI-ready system for $1,200. That led us to pick the nVidia GeForce 6800GT even though the ATI x800XL was our first choice. (www.nvidia.com; $296)

Windows XP Professional OEM

Although we flirted with the idea of Linux to save us cash, we decided it wouldn't be fair, as we couldn't run our standard benchmarks. And let's face it, where would life be without the spyware and Trojans? Here's a good tip, though: Instead of shelling out $200 for the retail version of Windows XP Pro, you can save a few ducats buy buying the "OEM" version. It's just a bare hologram disc with the certificate-of-authenticity sticker, but what else do you need? The catch is, you need to buy a piece of hardware with it. Fortunately, most stores consider a power-splitter cable to be "hardware." (www.microsoft.com, $145)

Motherboard: MSI K8N Neo4/SLI



The foundation of our budget PC gave us our flexible upgrade paths. From SLI to dual-core processors, the K8N Neo4/SLI can run it. And with its onboard Sound Blaster Live! chip, we even get hardware audio for free. (www.msicomputer.com, $150)

Maxtor 300GB DiamondMax 10 SATA

We still give an editor a hard time for proclaiming that he couldn't foresee ever "needing 75GB of storage" when the first 75GB IDE drive arrived in our lab. Yet, just five years later we're putting a 300GB drive into a "budget" box. The 7,200rpm DiamondMax 10 features 16MB of cache, runs native SATA, and is among the fastest-of-its-class hard-drives today. (www.maxtor.com; $175)

Case: Antec Performance TX640B Series

You get what you pay for. With those cheap $50 cases, the "free" power supply is usually worthless. Fortunately, that's not so with Antec's cases, which give you Antec-branded PSUs. In the TX640B, you get a 400-watt ATX 12V 2.0 spec supply with a PCI-Express power plug. Even better, the TX640B is a nicely adorned case that's solidly built and comes with variable-speed fans. (You will need to upgrade the PSU later if you want to add SLI.) (www.antec.com, $115)

1GB DDR400 Corsair RAM

We settled on 1GB of DDR400 RAM in two slots, which is our minimum recommended RAM these days. Sure, a few games run faster with 2GB of RAM but we didn't want to put our budget too out of whack. Since there's two other slots in the mobo, you can always upgrade down the road, too. (www.corsair.com; $110)

Grand Total: $1,255

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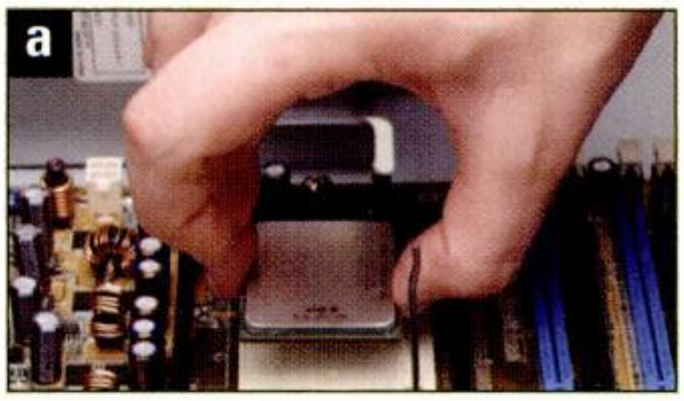
Build it!

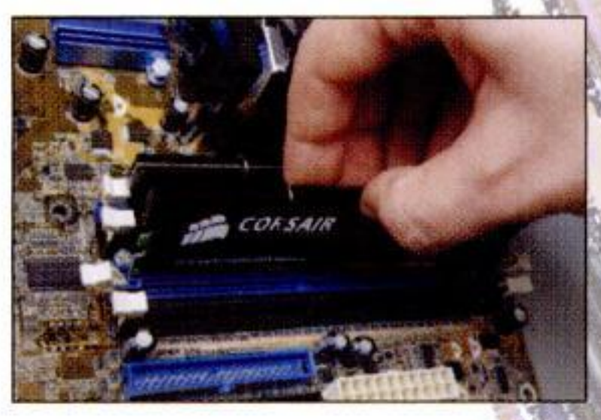
Step 6: Socket your processor

This is the most delicate part of your installation, so take your time. Make sure you're grounded before you handle the CPU (simply touch a metal portion of the case before you pick it up), and we can get started. For old-style Athlon and Pentium 4 processors, the procedure is the same. If you have a new Intel LGA775 processor, check the sidebar at the bottom of this page. First, you need to lift the little lever beside the socket. Next, line the processor up with the socket; one corner will be keyed, so that the proc can only go into the socket one way. Gently lower the chip into the socket **(a)**. *Make certain you do NOT apply any force to the processor. This can damage it permanently*! It should drop into place. Once it does, you can lower the lever back down until it clicks.

Now you need to add thermal paste to the CPU **(b)**. (If you're using a stock Intel or AMD heatsink, use the thermal pad that's provided.) Apply a thin layer of paste to your CPU's heat spreader. Smooth it down with a business card or other suitable trowel. Then affix the heatsink to the socket. Usually, this is as simple as setting the heatsink in the socket, lining up a couple of clips, and snapping them into place.

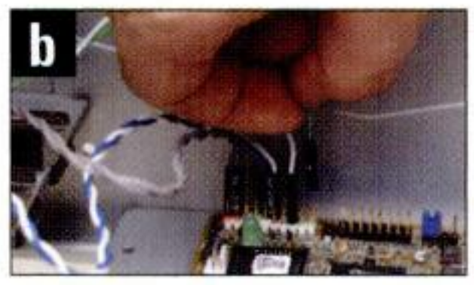


Step 7: Don't forget memory



Installing RAM is very easy, but it requires more force than most people expect. To install memory, first consult your motherboard's documentation to determine which slots you need to put memory in to enable dual-channel mode. Usually they're color-coded, but this can vary among manufacturers. Once you know which slots to use, examine the RAM and the memory slot. Note that the sticks only go in one way. Line up the notch in the RAM stick with the key in the slot and then push down on the stick, applying even force to both ends of the stick until it clicks into place. Repeat with the second stick.

Step 8: Arm the switches

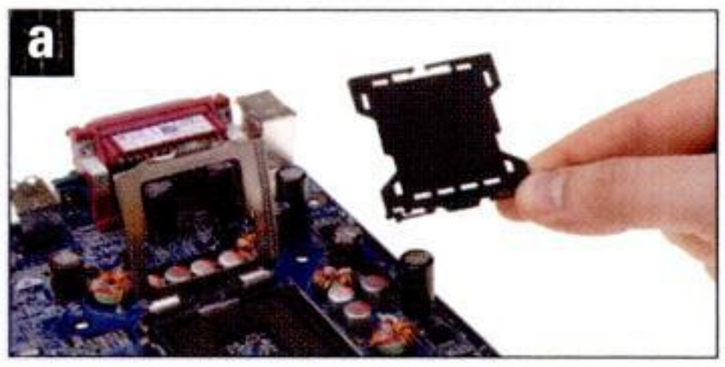


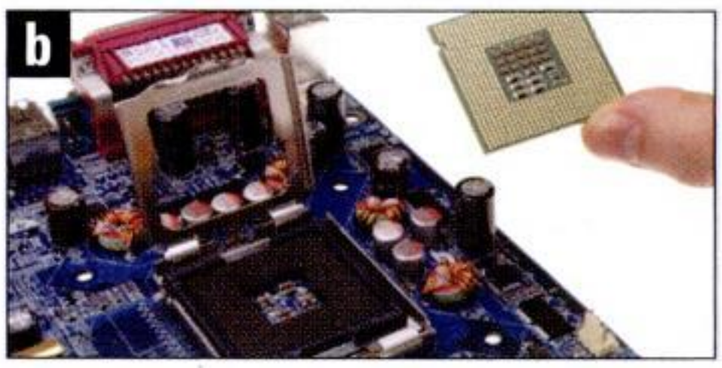
Now you need to connect your case's buttons and lights to your motherboard. You'll need to consult your mobo's manual again, as each motherboard is different. Connecting the headers, which run from the case to the mobo, is as simple as lining up the pins **(a)** and applying a tiny amount of force, until the wire slides into place **(b)**.

All you really need to get your system up and running is the power switch connector, but don't be a half-ass. Once you've connected the reset and power switches, it's time for the lights. It doesn't matter which wire goes to which lead for the switches, but the lights require proper polarity. Your mobo manual will tell you which of the pins is positive; usually the wire that's colored is the positive lead. If you get it backwards, don't worry.

How to Install Your LGA775 Processor—the Right Way

Much like your friendly *Maximum PC* editor, Intel's new LGA775 CPU interface is delicate and fragile. Read this before you install yours to avoid permanent damage.





Intel's new LGA775 CPU interface is supposed to herald a new era of performance by eliminating the need for pins in the CPU and reducing resistance. Unfortunately, because LGA775 moves the fragile pins to the motherboard, the socket's official lifespan is a meager 25 insertions. Because the new socket is so delicate, you need to finesse it.

Before you handle a processor, make sure you're grounded. Unlock the socket lever on your new motherboard and flip open the load plate. You should notice a plastic cover on the metal load plate. Remove this plate and keep it somewhere safe **(a)**. If you need to ship the board without the processor in it, this cover will provide protection. (Some motherboard vendors, in fact, will only honor RMA if you ship the board with this cover.)

Pick up the CPU with your thumb and index finger **(b)** and carefully align it with the notches in the socket. Insert the CPU straight down into the socket **(c)**. Be careful not to slide or drop any part of the processor when you seat it—this will bend the pins! Once the CPU is seated and the notches match, put the load plate down and lower the socket lever. You're good to go.

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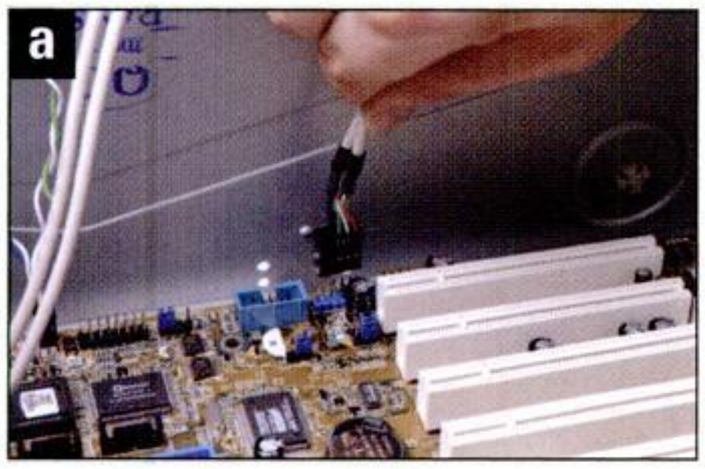
Step 9: Power external peripherals

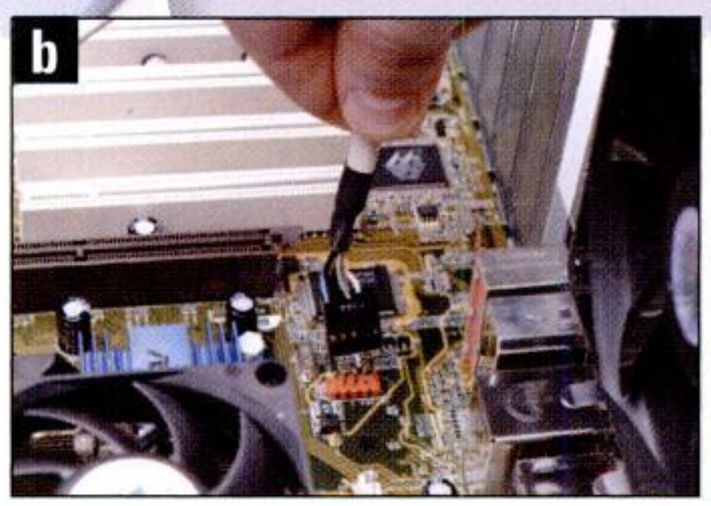
Connecting USB and FireWire ports is simple. Today, case enclosures include pre-configured connectors for each type of port. All you need to do is line up the connector with the header on the mobo, and gently push down.



Both FireWire and USB cables are keyed so they won't go in if they're not lined up properly.

Occasionally, you'll find a case where the USB cables aren't in a convenient connector block; instead, each wire is separate. If that's the case, your mobo manual should include a pin-out diagram that will show you how to connect the wires.

Make absolutely certain you don't switch the USB **(a)** and FireWire **(b)** headers—it's not always easy to tell the cables apart. Consult your case manual if you're not positive which is which. If you make this mistake and then plug a device into the wrong port, you can



destroy both the device and the motherboard you're connecting it to!

Many motherboards lack onboard headers for front-mounted FireWire, but there's an alternative. Most Sound Blaster Audigy 2 cards include internal FireWire headers. When you install the soundcard, just slip your FireWire cable onto the header at the top of the PCI card.

Caution!

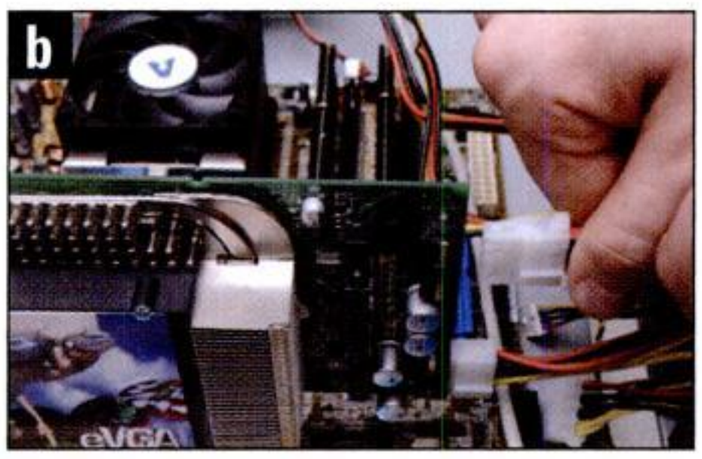
"If you plug a FireWire device into a USB bus, you can destroy both the device and the motherboard you're connecting it to!"

Step 10: Install the videocard

Installing a videocard is super simple. First, you need to remove the slot cover that lines up with your AGP or PCI Express slot. If you're having trouble telling which slot is which, the videocard slot is usually the one closest to your CPU.

The trick to installing any kind of card in a slot is to apply gentle force evenly across the length of the board. You should not have to push hard at all to get an AGP or PCI Express board into its slot. Line up the card's backplate (the piece of metal with the output connectors on it) with the slot on your case, make sure the card is level with the slot **(a)**, and gently push the card down into the slot.

Once the card is securely in the slot, screw the backplate into the case, and connect external power from the

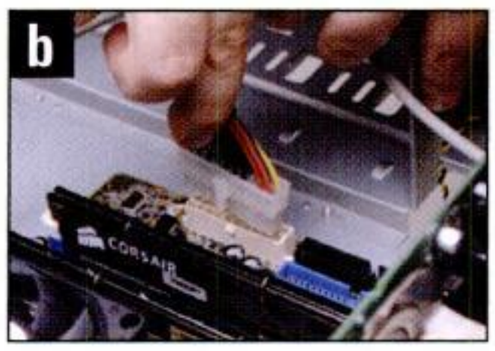


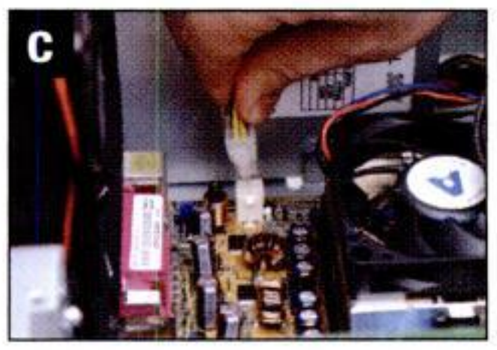
power supply. If you're using a card that requires multiple power inputs—like the GeForce 6800 Ultra **(b)**—you need to use two separate power cables. Using one cable with two ends doesn't deliver enough juice to the card.

Step 11: Alpha test: Take your rig for a test ride

Before we install the rest of the hardware, let's take a moment to power up your rig and make sure everything is working properly. First, verify that the CPU fan is connected to either the three-pin mobo header labeled CPU or to a four-pin Molex connector from your power supply **(a)**. Then plug the ATX power connector—it's the big, wide one that comes out of your power supply—into the appropriate socket on your mobo **(b)**. It's keyed, so it only goes in one way. You should also connect the ATX 12V connector to your mobo **(c)**. It too is keyed, and only goes in one way.

Once your power connectors are plugged in, connect your keyboard, monitor, and power to the machine. Now fire it up. You should see the power-on self-test (POST) screen. If you don't, don't get nervous! Even *Maximum PC* editors occasionally build machines that won't boot on the first try. If yours doesn't, turn to page 61 for some basic troubleshooting tips that should get you back on track. If it does, pat yourself on the back and move on to step 12.





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Build It!

Step 12: Prep your hard drives

Before you can mount your hard drives in your system, you need to prep the drives. First, consult your case manual and mount whatever kind of rails or other gizmos necessary to install your hard drives in your case. Once that's done, you need to configure your drives for your rig.

There are two basic interface technologies used for hard drives today: parallel ATA and Serial ATA. You're probably familiar with parallel ATA, which uses the wide, old-fashioned, 80-pin ribbon cables, but you may not have encountered Serial ATA drives yet. You can connect two devices to a single parallel ATA port, but connect only one to a Serial ATA port. We're going to explain how to configure both.

Parallel ATA

When you're connecting a parallel ATA drive to your system, whether it's a hard drive or optical drive, it's very important you configure the drive's master or slave settings. Parallel ATA drives connect to the IDE ports on your mobo. Each port is a single IDE channel. Remember, even though each IDE channel can support two drives (one drive configured as master and another configured as slave), your system will only be able to read or write to one drive at a time—this is important to keep in mind when configuring your parallel ATA devices. We've prepared three sample IDE configs at the bottom of this page.

A parallel ATA drive's master/slave setting is almost always configured with a series of small plastic jumpers. Put the jumper over one pair of pins, and the drive is set to master. Put it over the other, and it's set to slave. It's that simple.

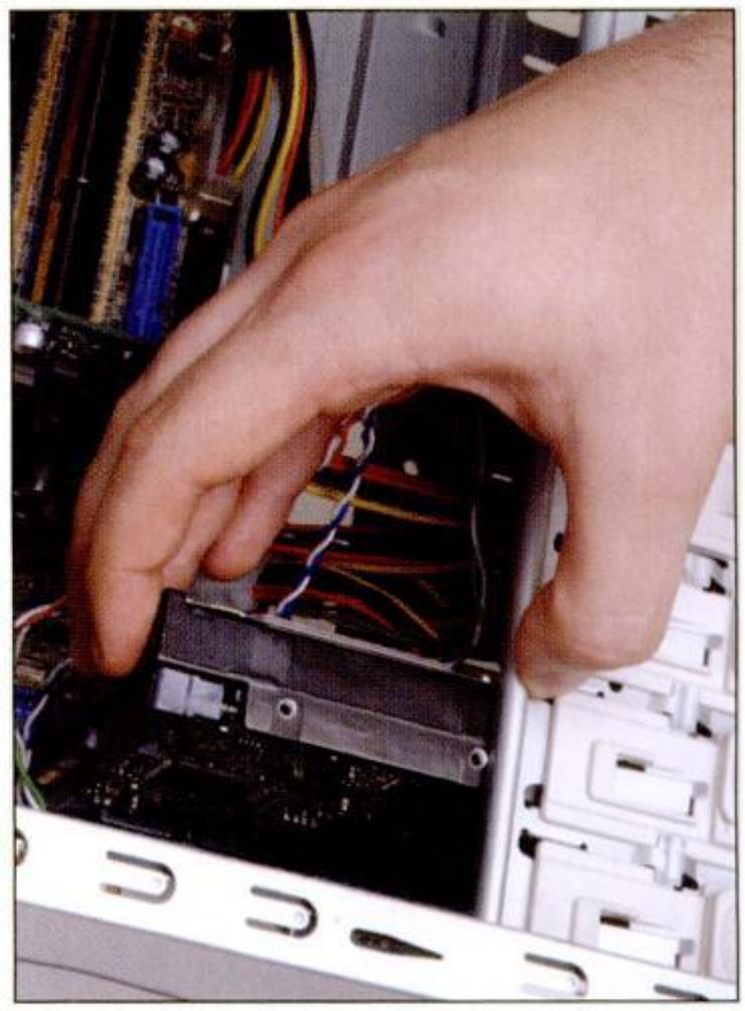
Serial ATA

Configuring Serial ATA drives is much easier than configuring parallel ATA drives. There are no annoying master/slave settings, and you don't have to worry about drives sharing channels. Your PC can access any Serial ATA drive at any time, no matter what other drives are being accessed.

Step 13: Mount the hard drives

This is another step that varies on a case-by-case basis. For most case enclosures, you'll want to slide your hard drives into one of the 3.5-inch bays with the connector side facing out. Once the drives are in the bay, line up the holes on the side of the drive with the holes in the bay, and screw the drive into place. We recommend using two screws on each side of the drive; more is overkill, and less is dangerous because your drives won't be stable enough.

Some newer cases use a tool-less mechanism to lock the hard drives into place. Installing your drives in these is simple: All you have to do is put the drive in the bay and slide the locking mechanism into place until it clicks. Easy, huh?



Three Tried-and-True Parallel ATA Drive Configurations

Modern systems have several IDE adapters, which makes IDE configuration decisions quite perplexing. Here are the three most common optical-drive configurations, and pros and cons for each.

HARD DRIVE AND OPTICAL DRIVE ON SEPARATE CHANNELS: This is an extremely common configuration. Because each drive has its own channel, the system can access both drives at the same time. The performance is especially appreciated when you're copying large volumes of data from an optical drive to the hard drive.

HARD DRIVE ON ONE CHANNEL, TWO OPTICALS ON THE SECOND CHANNEL: This setup places your hard drive on the primary channel while two optical drives share the secondary IDE channel. This configuration provides great optical drive-to-hard disk performance for either optical drive, but is practically useless for optical-to-optical disc copying because both drives share the same channel.

EACH DRIVE ON ITS OWN CHANNEL: In a perfect world, each hard drive and optical drive has its own IDE channel. All drives can work simultaneously, preventing any confusing situations like, say, using one optical drive for CD copying but the other for disc-to-disc copies because of IDE channel concerns. If you don't plan on using RAID, you can use these ports for secondary hard drives or optical drives.

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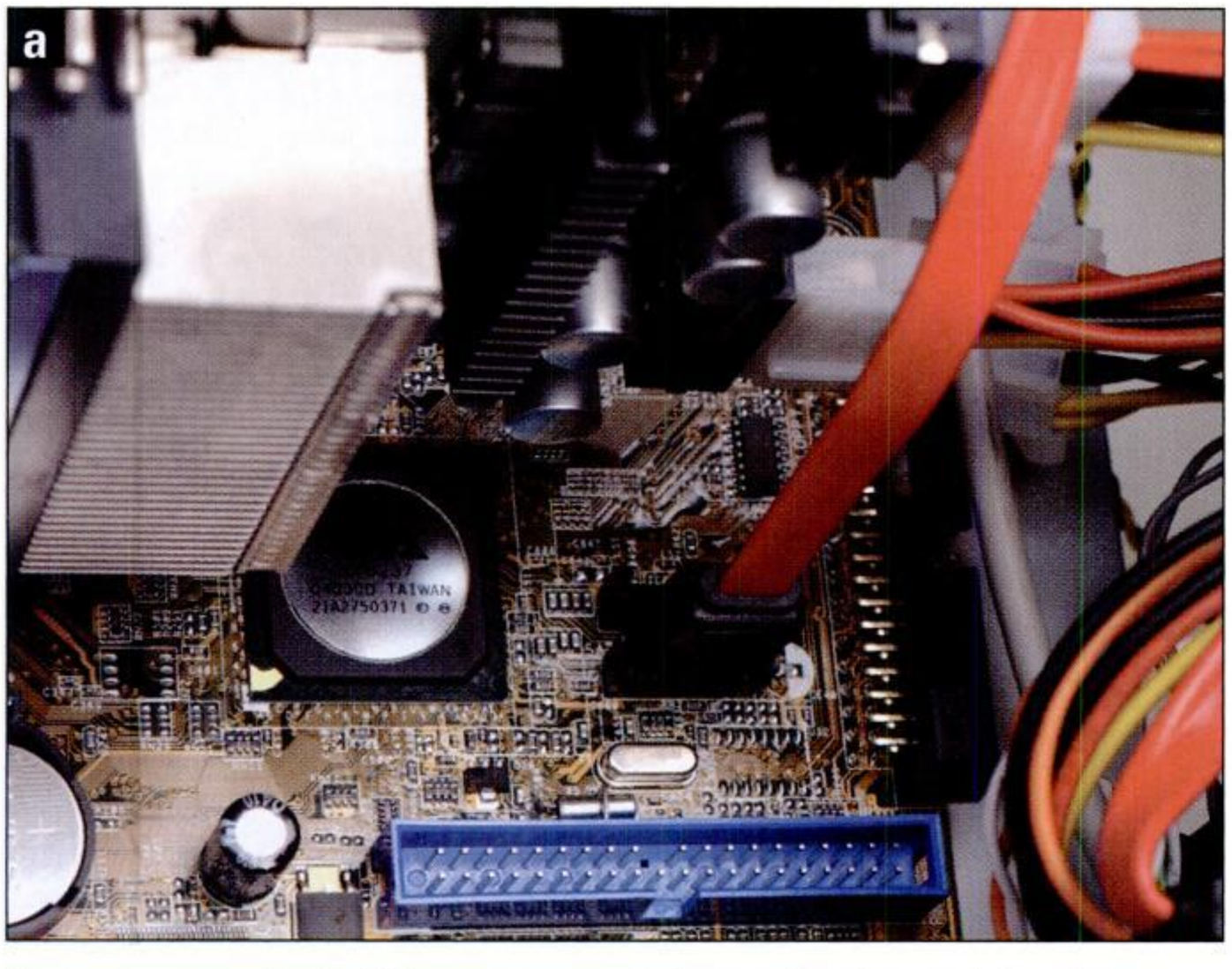
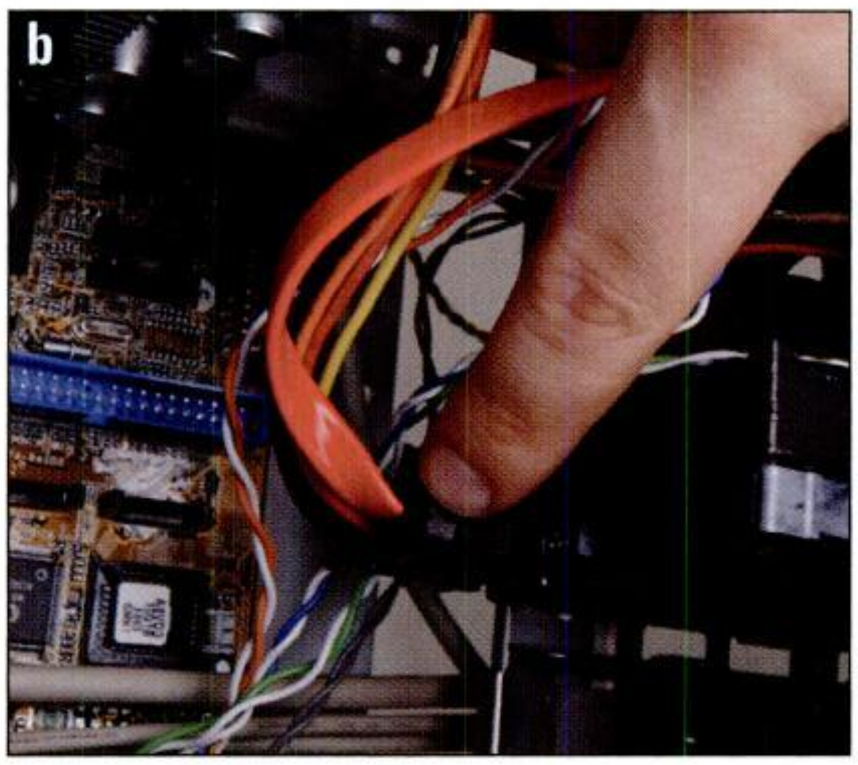
Step 14: Connect your hard drives



Next up, you need to feed data connections and power to your hard drives. If you're using Serial ATA drives, this is simple: Just plug each drive into one of your motherboard's Serial ATA ports **(a)**. We recommend using the ports built into your mobo's chipset for the drive that will contain Windows—you can find out which ports on the motherboard correspond to that Serial ATA controller by consulting your manual **(b)**. Be very careful connecting your Serial ATA cables. The connectors are easily broken, so make sure you don't put pressure on the motherboard or hard drive connectors. Also, some Serial ATA drives offer both a Serial ATA and old-fashioned four-pin Molex power connector. DO NOT USE BOTH POWER CONNECTORS! Use one or the other. It doesn't matter which.

Connecting parallel ATA drives is equally simple. With the old-style parallel ATA ribbon cable, you need to make sure all of your drives are within 18 inches of the motherboard's ports, and you need to be very careful not to bend any of the pins on either the mobo or the hard drive. Line up the cable with the port, and using even pressure, push the cable into the port. If you are going to install Windows on a parallel drive, we definitely recommend using the native parallel ATA ports. If you use a RAID controller or ports that use non-standard drivers, you'll have to endure the hassle of installing mass storage controller drivers every time you reinstall Windows.

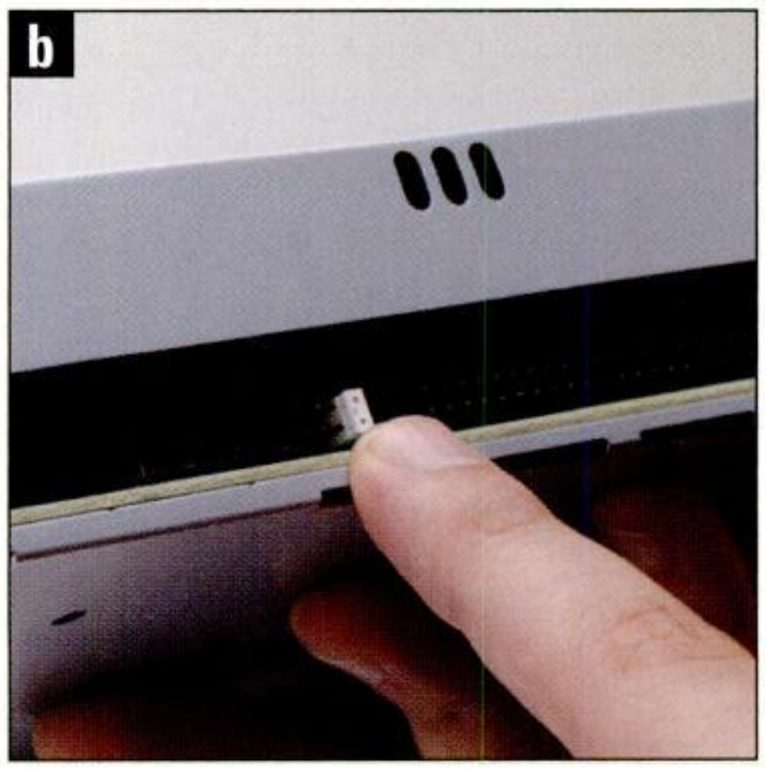


Caution! ***"Do not use both power connectors on your Serial ATA hard drives!"***

Step 15: Prep optical drives

Now it's time to get your optical drive (or drives) ready for your case. If your case uses any kind of drive rails, you need to attach them now. Attaching drive rails can be tricky: If you don't place them properly, your drive's front bezel won't be aligned with the front of the case. The only way to make adjustments is through trial and error. You'll have to mount the rails on the drive, slide it into the case, and give it the ol' eyeball. It may take a try or two to get the drive perfectly aligned.

Next, you need to make sure that your optical drives are configured with the proper master/slave settings. Most optical drives have labels on the top **(a)** that will show you the proper configuration for your jumpers. (Backtrack to step 12 if you need a refresher on configuring jumper settings **[b]**.)



Step 16: Mount the optical drives

Once again, it's time to mount drives in your case, but this time, they're optical. Before you can slide your DVD and/or CD drives into your case, remove the front slot covers from your case bezel. You shouldn't have to apply strong force to get them loose. If you're having difficulty, check your case manual.

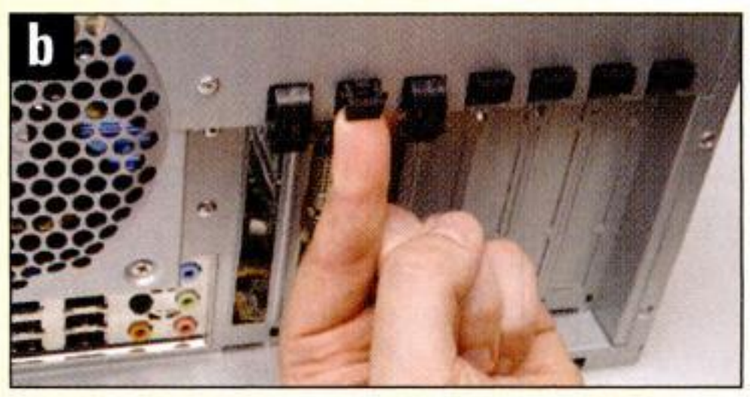
Step 17: Connect the optical drives

Just like hard drives, optical drives need to be connected to a mobo and a power source to work. Although we've heard rumors of the existence of Serial ATA optical drives, we have yet to actually see any, and we don't expect to before the end of this year. So for the time being, it's strictly parallel ATA cables for the optical drives.

The connections for your optical drives are exactly like those for parallel ATA hard drives, so attach the cables in the same way—line up the cable and apply even pressure to both sides of the connector. You'll also need to run a four-pin Molex power connector from the power supply to each of your optical drives. Maximum PC Lab technicians generally no longer bother with the analog CD audio connector or the SPDIF on their optical drives. They're not necessary now that all drives can digitally extract CD audio.

Step 18: Install the rest of your cards

We're almost there. Soundcards, network cards, TV tuner cards, and any other type of card you might want to install should be plugged into your rig now. Installing PCI cards is easy. First, remove the slot cover from your case for the PCI slot you want to use. It doesn't really matter which PCI slots you use for your devices. Next, line the card up with the slot **(a)**. Once you push it into place, lock it down using screws or your case's latches **(b)**.

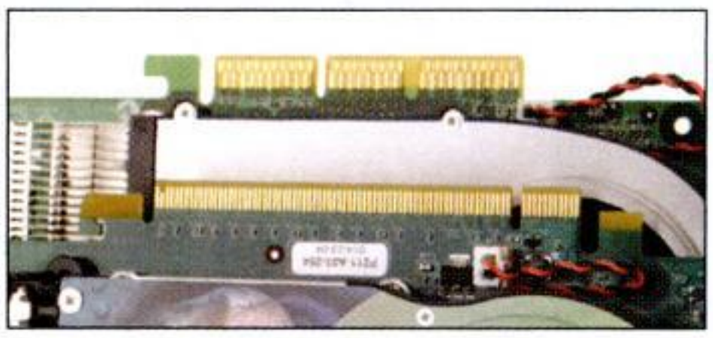


The Secret Serial Life of PCI Express

Why much faster data rates make PCI Express a must-have technology.

The PC world is going serial. First it was Serial ATA and now it's PCI Express. That's because it's far easier to ratchet up bus speeds when a signal is sent over a few wires rather than the dozens of wires used in parallel connections. The PCI Express graphics slot will initially be able to transfer 4GB of data in both directions. (Compare that to the 8x AGP slot, which can reach just 2.1GB/s in one direction.)

For all the rest of your add-in cards, the tiny x1 (pronounced *bi-1*) connector almost doubles the bandwidth of PCI from 133MB/s to 250MB/s. To add more bandwidth, chipset and board designers simply increase the number of "lanes" to each connection. Eventually motherboards will have x4 slots for add-in cards that will support up to 1GB/s of traffic.



A PCI Express card (bottom) has a single row of connectors, while an AGP card (top) has two rows of connectors.

Almost all PCI Express mobos use the new ATX 2.0 power spec (white). PCI Express graphics cards use a new 6-pin power connector (black) as well.

Inserting a PCI Express graphics card is really no different than installing an AGP card.

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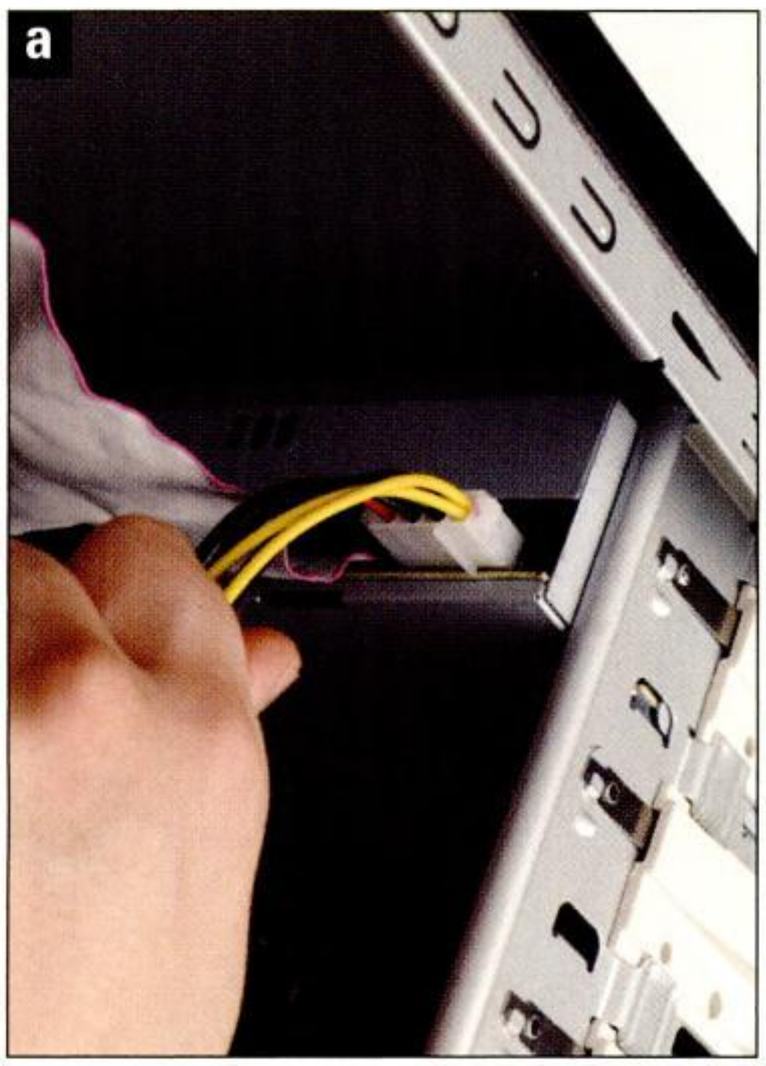
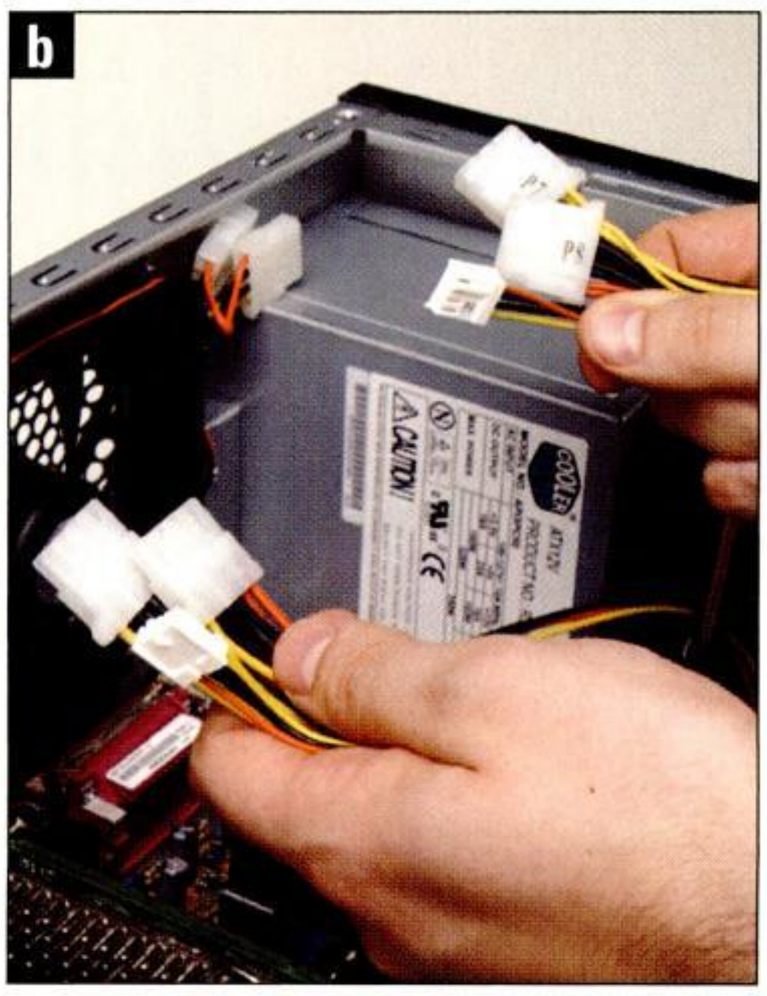
Build It!

Step 19: Last-minute housecleaning

It's exciting when you've installed the last piece of hardware, but you're not totally done with construction until you've done a thorough double-check. You need to ensure that each component that requires power is connected to the power supply **(a)**, that all your fans have power, and that your cables are tidy **(b)**—tucking them out of sight will not only make the interior of your machine more attractive, it will also improve airflow and thus cooling in your case! Get this right now, and you'll make life a lot easier on yourself.





How to Tweak Your BIOS for Performance and Reliability

Even the smallest changes to the BIOS can have a big effect. Here are our two favorite BIOS tips. Keep in mind that each BIOS is a little different, so you may need to dig around in your BIOS to find the appropriate settings.

ADJUST YOUR CAS LATENCY

Manually tweaking your memory settings can yield big performance gains. The memory timing menu is usually located in the Advanced Chipset screen or a submenu of this screen. Before you can adjust the memory timing, you must change the setting for "Configure SDRAM Timing" from the default of SPD to User **(a)**. SPD uses the settings built into a chip on the memory modules to determine the memory timings. User lets you select your own timings. If you need to determine the standard timing values for your memory modules and the information isn't available in the BIOS, check the memory vendor's web site for the modules' data sheet.

Memory speeds are described in two different ways: frequency (measured in MHz) and latency (how quickly the module can send data after receiving a request). DDR SDRAM is available with CAS latency values of 2.5 and 2.

To improve performance, try using a lower latency value. For example, if your memory has a CAS latency value of 2.5, try 2 instead. If the system won't run properly, go back to the default CAS latency and try other adjustments.

a

DRAM Timing Control

Current Host Clock	133 MHz
Configure SDRAM Timing by	SPD
SDRAM Frequency	Auto
SDRAM CAS# Latency	Auto
Row Precharge Time	Auto
RAS Pulse Width	Auto
RAS to CAS Delay	Auto
Bank Interleave	Auto
DDR DQS Input Delay	Auto
SDRAM Burst Length	4 QW
SDRAM 1T Command	Disabled
Fast Command	Normal
Fast R-2-R Turnaround	Disabled

ADJUST YOUR MEMORY TIMING

Depending on the BIOS your system uses, you can also adjust other memory timing factors, such as Row precharge time, RAS pulse width, and RAS-to-CAS delay **(b)**. Row precharge time (also referred to as tRP) refers to the amount of time needed (in clock cycles) to activate the memory bank. RAS pulse width (tRAS) refers to the amount of time (in clock cycles) to leave the row of memory open for data transfers. RAS-to-CAS delay (tRCD) refers to the amount of time needed to switch to a different row of memory to access data not found in the current row. For maximum speed, these should be set as fast as possible (smaller values are faster). Try changing one setting at a time, and testing the stability with a memory benchmark like *Memtest86* **(www.memtest86.com)**.

b

DRAM Timing Control

Current Host Clock	133 MHz
Configure SDRAM Timing by	User
SDRAM Frequency	Auto
SDRAM CAS# Latency	2
Row Precharge Time	2T
RAS Pulse Width	5T
RAS to CAS Delay	2T
Bank Interleave	4-Way
DDR DQS Input Delay	Auto
SDRAM Burst Length	8 QW
SDRAM 1T Command	Disabled
Fast Command	Ultra
Fast R-2-R Turnaround	Enabled

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Step 20: Configure your BIOS

Now it's time to configure your system's BIOS. Connect your monitor, keyboard, and mouse, and power up your machine. Make sure you press the appropriate key to get into your BIOS—it's different for different BIOS types, but you should see a prompt when you first boot your PC. There are two main settings you need to tweak before you can start installing Windows: the CPU speed and the boot order. Once your machine is up and running, you can perform some more advanced tweaks (see the sidebar on previous page).

As a general rule, adjusting the CPU speed is as simple as entering the appropriate menu, usually called CPU Speed or SoftBIOS, and setting the CPU speed to automatic.

You also need to set your BIOS to boot off of the hard drive first, and then the optical drive if it can't find a bootable hard drive. Look for a setting labeled Boot Order (it's usually in Boot Options) and change the default order so that your main hard drive is first. This will allow you to boot off the optical drive to install Windows, but avoid waiting for the optical drives to spin up every time you boot the system after Windows is installed.

Caution! *Be careful when you configure your BIOS! A misstep can fry your CPU.*

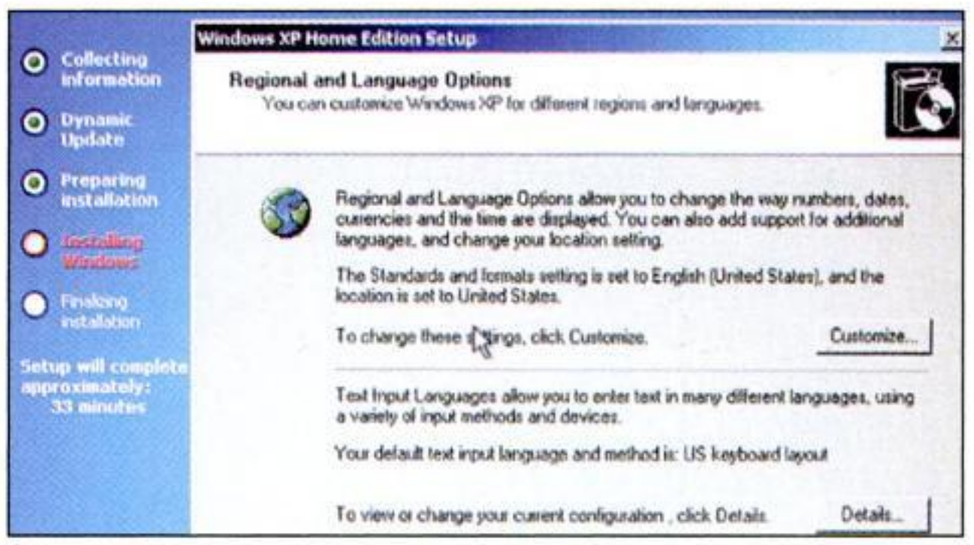
Step 21: Install Windows XP

To install Windows, all you need to do is pop the CD-ROM into the drive, then press the "any" key when you see a screen prompting you to "Press any key to boot from CD."

After your system has booted off the CD, the installer will start the text mode part of the setup. If you want to install Windows on a SCSI drive or RAID array that XP doesn't include drivers for, you'll need to press F6 and install the drivers as soon as you see the blue screen. Otherwise, wait for the Welcome screen.

Follow the prompts until you get to the partitioning screen. Assuming you're using a new hard drive, you'll need to tell Windows how you want to configure your disk. For maximum performance with XP, we recommend creating one big partition that spans the entire drive. We recommend that you use the NTFS format for your new drive. Remember to always do a thorough format on a brand-new hard drive!

Your PC should now be into the GUI stage of the install. The first screen you'll see is the language options screen. Unless you have a nonstandard keyboard layout, or don't live in the U.S., continue to the next step.


Windows XP Home Edition Setup
Collecting information
Dynamic Update
Preparing installation
Installing Windows
Finalizing installation
Setup will complete approximately: 33 minutes
Regional and Language Options
You can customize Windows XP for different regions and languages.
Regional and Language Options allow you to change the way numbers, dates, currencies and the time are displayed. You can also add support for additional languages, and change your location setting.
The Standards and formats setting is set to English (United States), and the location is set to United States.
To change these settings, click Customize.
Customize...
Text Input Languages allow you to enter text in many different languages, using a variety of input methods and devices.
Your default text input language and method is: US keyboard layout
To view or change your current configuration, click Details.
Details...

The last major step you have to wade through is the setup of your network. Typical settings work for most cable modems and DSL connections, although you'll need to use manual settings if you have a statically assigned IP address or use some sort of wonky PPPoE connection. After the network is configured, Windows should reboot one last time.

Following the final reboot, you'll be prompted to activate Windows. We recommend that you hold off until you have all the drivers set up for your hardware and everything is working properly.

Chances are, you'll need to go online to fetch all the latest updates, drivers, and patches for your system. Before you connect to the Internet, make sure you enable the built-in firewall. You can disable it after you've patched the OS, but it will protect your rig until you install the critical updates. To enable the firewall, go to the Control Panel, click Network and Internet Connections, then click Network Connections. Right-click on your connection and click Properties. Go to the Advanced tab and click "Protect my computer and network by limiting or preventing access to the computer from the Internet." Now you can connect to the net a little more safely!

Next, install Service Pack 2. Open *Internet Explorer* and go to **www.windowsupdate.com.** Click the Scan for Updates button and go directly to the Critical Updates and Service Packs section. Install Service Pack 2, and reboot your computer when prompted.

Once the Service Pack is installed, you should install your motherboard's chipset drivers. You should be able to download them from your motherboard manufacturer's web site. They're sometimes called 4-in-1 drivers or the chipset software, depending on the manufacturer. Make sure you reboot when you're done.

Now, go back to **www.windowsupdate.com** and install the latest version of DirectX.

We're almost done. Go to your videocard chipset manufacturer's web site and download the latest version of your videocard's drivers. Once you install them, you'll probably have to reboot.

Install drivers for your soundcard and any other hardware you might have. It's always best to download updated drivers from the manufacturer's web site, but if new drivers aren't being offered, you can always use the drivers off the CD that came with the hardware.

After all your drivers are installed, go back to **www.windowsupdate.com** once again and install all the updates in the Critical Updates section. After the final reboot, you're ready to start using your machine! Did you hear that? You're ready to start using your machine!

GET YOUR DRIVERS HERE!

Without the latest drivers, your machine won't run at its best. Get your chipset and videocard drivers directly from the manufacturers before you build.

CHIPSETS

Via: www.viaarena.com
Intel: support.intel.com
nVidia: www.nvidia.com
SiS: www.sis.com

VIDEOCARD

nVidia: www.nvidia.com
ATI: www.ati.com

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Build It!

What to Do If it Doesn't Work

Even *Maximum PC* editors occasionally have problems with their newly built PCs. Here are the three most common PC building problems, and the *Maximum PC*-approved tips for troubleshooting!

Q I turned on my PC for the first time, and nothing happened. The monitor didn't turn on and there were no tell-tale beeps. The power light is on, but no one's home!

A A completely nonresponsive PC could be the result of any number of problems. First, ensure that your case speaker is plugged into the speaker header on the mobo (if your machine is having trouble booting, it will beep to let you know the nature of the problem). If your machine has both onboard video and a videocard, this could cause a conflict. Try swapping the monitor to the other VGA output, at least long enough to disable the onboard video.

If you're still having trouble booting, you might have a more serious hardware problem. There's a good chance your CPU isn't properly seated. You need to remove it from the socket, clean it off with 99-percent isopropyl rubbing alcohol and a paper towel, and then reseat it, and reinstall the heatsink. Be careful when you pull the heatsink off of the CPU: You may need to twist the heatsink slightly to get it to release from the CPU without forcibly yanking the CPU from its socket.

The last thing to check for is a misplaced motherboard standoff. If you have an extra mobo standoff screwed into your tray, it can short out crucial components of your mobo and render your system unbootable. Unfortunately, the only way to check for extra standoffs is to completely remove the mobo from the case.

Q I'm having trouble getting the Windows installation started. Why won't it start?

A Most likely, Windows is having trouble detecting your hard drive. The first thing you should do is check your cables. Make sure your cables are firmly connected at both the drive and the motherboard end, and that your power cable is plugged into the drive.

If your cables are in good order, you should ensure that your hard drive is plugged into the proper port. Unless you're installing Windows on a RAID array, you should connect your drive to the ports connected to your chipset's native controller. You should also ensure that the proper ports are enabled in your BIOS and are set to the correct mode. Some motherboards allow you to use Serial ATA ports for either standard drives or a RAID array. You'll need to consult your documentation for the specifics.

If for some reason, Windows still doesn't see your hard drive, you may need to install drivers for your controller. To install the drivers, you need to temporarily connect a floppy drive your computer. Connect the floppy, then boot your computer and start the Windows installer. Press F6 when prompted to install your driver. Put the driver floppy that came with the motherboard in the floppy drive and follow the onscreen prompts.

Q I powered up my machine and it's making all sorts of beeping noises! What do they mean?

A Beeping noises generally mean there's a problem with a crucial piece of hardware. They can mean that your memory isn't properly inserted, that there's a problem with your videocard, or even that your keyboard isn't properly plugged in. Error codes vary from mobo to mobo; consult your motherboard manual to decode the specific beep code you're hearing. ■

The 7 Dos and Don'ts of PC Building

DON'T Close the PC case before your first boot! Doing so will invoke Murphy's Law, guaranteeing that something will go wrong and you'll just have to open up the case again.

DO Write down the model numbers and serial numbers of all your internal hardware in case you need to download documentation or call technical support later when the PC case is closed.

DON'T Work inside the PC while the power is on.

DO Check your case fans often for gunk buildup. A fan can't do its job if it's clogged with cat hair!

DO Screw in your hard drives and optical drives on both sides. It helps stabilize the drives and reduce noise.

DO Make sure you have an adequate power supply for your hardware. A 350W power supply is the bare minimum today. You need 450W or higher for a fully loaded gaming rig.

DON'T Position your hard drives too close together! If you're using more than two drives, allow some room for airflow between them. Heat kills!

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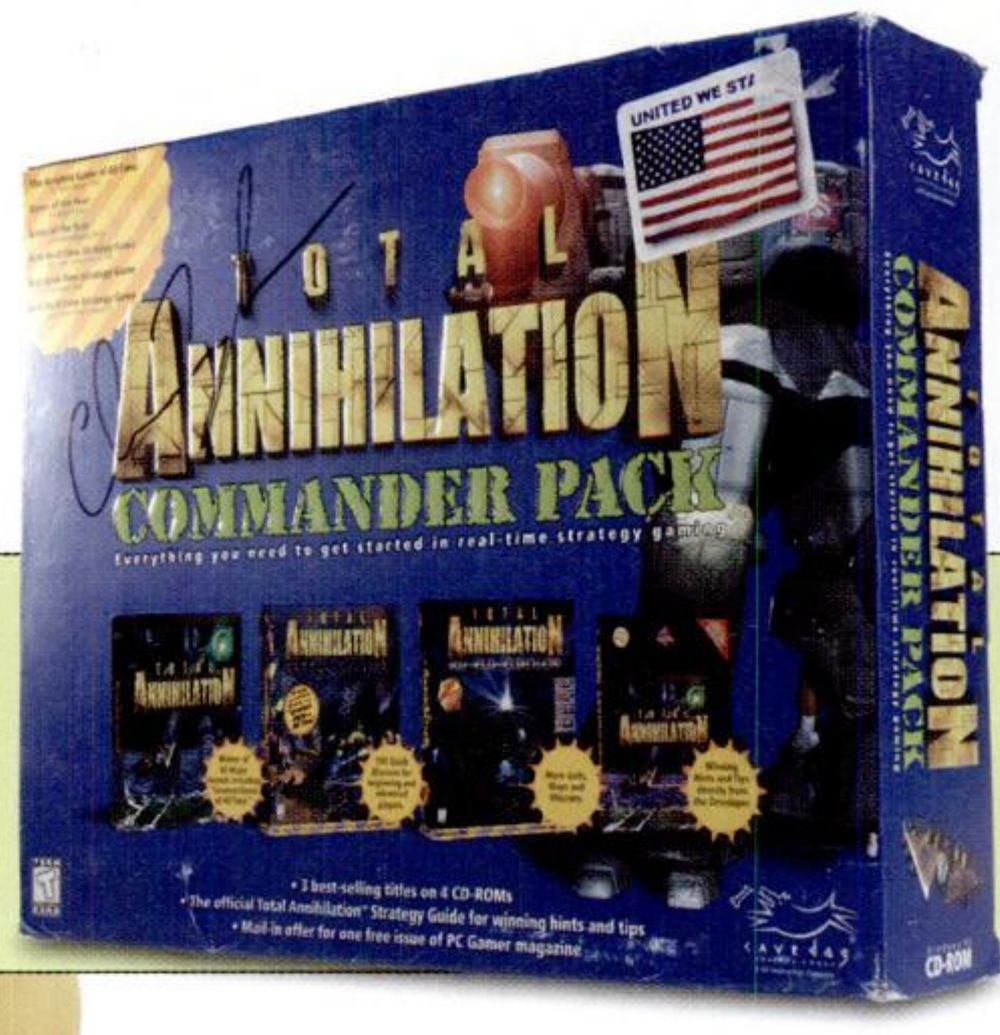
Gaming College

Think you've got what it takes to tackle Maximum PC's "Gameology" degree program? Enroll and find out!

So, you think you're an "expert" gamer, eh? Sorry, beating *Half-Life 2* or winning a stage of *Battlefield 2* just doesn't impress us. To truly call yourself an expert, your experience must encompass multiple genres, and your list of beaten games must include a few older classics—as well as the latest "hot" game of the moment. If not, how can you expect to hold up your end of the conversation at your local LAN party's post-match cocktail party?

We jest, but only partly. If you're relatively new to the PC gaming phenomenon, there's a truck-load of incredible, genre-defining games that you've missed out on, old and new. To truly appreciate the mastery that is *Half-Life 2*, you must experience its predecessor. Are real-time strategy (RTS) games your bag—perhaps *Battle for Middle-Earth* or *Empire Earth II* drew you in? Then you owe it to yourself to dial back the time machine and load up *Age of Empires* or *Total Annihilation*.

To achieve an accurate snapshot of the games that have defined and helped raise the PC gaming hobby out of the basement and into the limelight it duly deserves today, you need to get your "Gameology" degree—and we've got your degree program in the following pages. We've culled three titles for every major genre that represent the current cream of the crop—A-list games that entertained, innovated, and advanced their respective genres. Complete the first for your BS degree, the second for your Master's, and the third—plus all the "extra credit" assignments—for your Ph.D. Unless otherwise noted, you must beat every game on the default setting to advance your degree to the next level.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Treasure Hunt!

Most of the older games listed here can still be found in the bargain bins at your local GameStop, Wal-Mart, or Costco. However, a few—such as *Total Annihilation*—may require some digging on eBay, Amazon.com, or online "vintage" software sites such as **www.rochnet.net**.

First-Person Shooters

Shoot first, ask questions later!

The FPS genre is definitely PC Gaming's "rockstar"—generating the most press (positive and negative) and excitement, and typically requiring the fastest PC hardware. The genre has come a long way since games such as *Ultima Underworld* and the first *Doom* crawled out of the primordial ooze: Graphics have evolved from barely recognizable 2D bitmaps to nearly photorealistic 3D masterpieces.

■ Bachelor of Science: *Call of Duty*

This game set a new standard for raw, visceral action—one-upping *Medal of Honor: Allied Assault* and renewing interest in WWII-themed games. Complete it, and its *United Offensive* add-on.

■ Extra Credit: *Doom 3*

Built by the company credited for the birth of the FPS genre, id Software, *Doom 3's* retro-style gameplay is a history lesson that must be experienced.

■ Master's: *Half-Life 2*

Easily the reigning kill of the FPS heap, this game has it all: gripping action, awesome visuals, and a top-notch story with excellent pacing. Beat it on Hard—twice!

■ Extra Credit: *Half-Life Platinum*

This compilation includes the original *Half-life* and all of its add-ons. Grab it while you still can for less than $20!

■ Ph.D: *Deus Ex*

Just about everyone's "Best Game of 2000," *Deus Ex* opened gamers' (and developers') eyes to "immersive entertainment." And it introduced open-ended gameplay to the genre. If you can't stomach the somewhat dated visuals, we'll accept *the less-satisfying Deus Ex II: Invisible War* as a substitute.

■ Extra Credit: *Doom: Collector's Edition*

This compilation—updated for Windows—includes *Ultimate Doom*, *Doom II*, and *Final Doom*. Beat at least one of them.

Collector's Editions

Popular games will often be re-released as "collector's editions," usually including sequels and/or add-on packs. These can be great bargains, and an excellent way to familiarize yourself with a given franchise. A few, such as the *id Anthology*, will also carry a "collector's" price, fetching as much as $400 in mint condition on eBay.

The id Anthology is the greatest "Collector's Edition" ever made.

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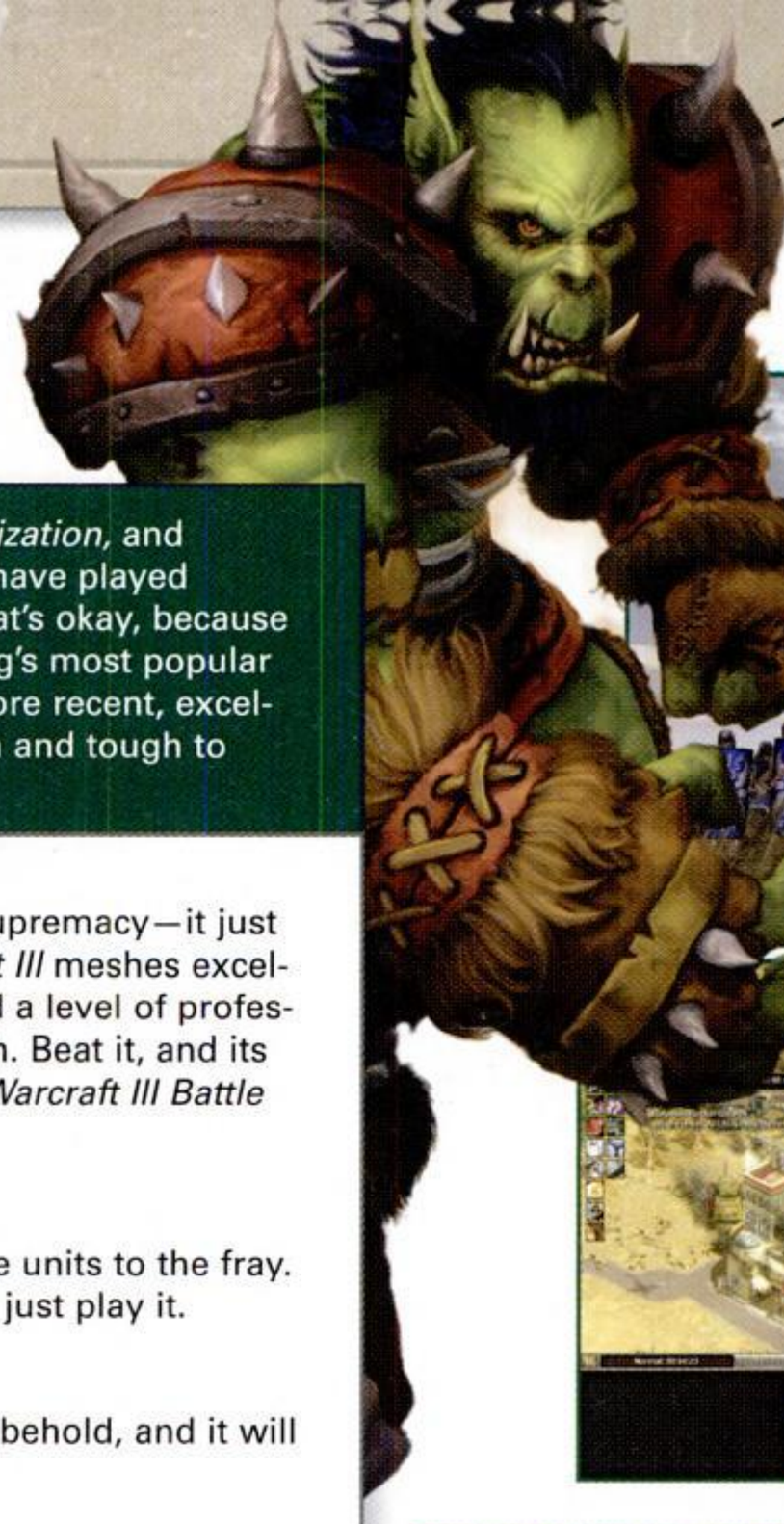

Strategy

Point, click, and destroy!

Some of you may know the names *Dune II, Civilization,* and *Command & Conquer*—but we bet few of you have played these classics, which came out in the '90's. And that's okay, because while they shaped what is today one of PC Gaming's most popular genres—real-time strategy—there are plenty of more recent, excellent titles to choose from. Most are simple to learn and tough to master—and they can be utterly addictive.

Bachelor of Science: *Warcraft III*

Orcs and Humans locked in a timeless battle for supremacy—it just doesn't get any better than this. Blizzard's *Warcraft III* meshes excellent visuals and story with well-balanced units and a level of professional polish that few companies are able to match. Beat it, and its add-on, *Frozen Throne*—both are available in the *Warcraft III Battle Chest.*

Extra Credit: *Total Annihilation*

The first 3D RTS, *TA* also introduced downloadable units to the fray. Find it anywhere you can—eBay, most likely—and just play it.

Master's: *Rome: Total War*

Total War's massive battles are truly something to behold, and it will force you to sharpen your tactical skills.

Extra Credit: *Civilization III*

The latest installment—a sequel is coming—of one of the most addictive, and popular, turn-based strategic gaming franchises ever made.

Ph.D: *Rise of Nations*

Covering the Stone Age through the modern day, *Rise* is one of the most challenging—and deep—RTS games you can find. Beat it on Hard—and call every RTS game thereafter "your bitch."

Extra Credit: *Age of Empires: Collector's Edition*

This collector's pack includes the original *AOE, AOE II,* and both of their add-ons. Complete at least one.

Rome: Total War

Rise of Nations

Warcraft III

Roleplaying

Not just for geeks anymore!

If those multi-sided dice, thick manuals, costumes, and associated "geek" status kept you away from pen-and-paper roleplaying games in high school—the computer RPG is for you. One of the oldest of gaming genres, these games are all about putting yourselves in the shoes of a nameless character, "buffing it up" (building up its stats, experience, and equipment), and typically saving some fantasy world from extinction at the hands of evil. Pick up that mace and start cleaving skulls! *...cont'd*

Morrowind

Diablo

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Roleplaying ...continued

■ BACHELOR OF SCIENCE: *Diablo II*

Considered the ultimate example of "RPG-lite," there's no better starting point than this classic, which is also the sequel to one of PC gaming's best-selling titles, *Diablo*. It takes everything we loved about the original and perfects its simple action/RPG formula. (And adds online play with Battle.net.)

■ EXTRA CREDIT: *Diablo Battle Chest*

The original *Diablo* repackaged with its add-on, for cheaps!

■ MASTER'S: *Knights of the Old Republic*

The BioWare boys get their mitts on the Star Wars license and do it right.

■ EXTRA CREDIT: *Neverwinter Nights*

Dungeonmasters everywhere dove right into this insanely mod-able *D&D* RPG. Beat the main quest, and download and install one mod—any mod.

■ PH.D: *Morrowind*

Old school CRPG vets will speak fondly of the early *Elder Scrolls* games from Bethesda. We won't make you go back and suffer through those dated visuals: Instead, pick up the latest iteration, *Morrowind*, and beat its main quest.

■ EXTRA CREDIT: *Baldur's Gate* AND/OR *Baldur's Gate II*

Either of these is a must-play to see why BioWare—with three games in this list—is one of the most highly regarded RPG makers going.

Neverwinter Nights

Pacific Fighters

NASCAR SimRacing

Silent Hunter III

Simulation

We feel the need—the need for speed!

Long the hallmark of PC gaming, simulations are becoming few and far between these days—they simply don't sell as well as more "mainstream" games. Still, their influence on the hobby, and their penchant for pushing PC hardware to its limits, should not be overlooked. Plus, if you've the time and patience to put into them, they're pretty damn rewarding! (We include any game based on flying or driving in this category.) Simulations are so time-intensive that we'll only require one extra-credit assignment for your Ph.D.

■ BACHELOR OF SCIENCE: *Need for Speed Underground 2*

The PC's version of *The Fast and the Furious*, this street racer will test your reflexes. Okay, so it's more of an arcade racer than a "sim." But who cares — it's fun!

■ MASTER'S: *Silent Hunter III*

Even some staunch anti-simulation members of the Maximum PC crew became semi-addicted to this WWII submarine simulation. It's gorgeous, and its cat-and-mouse gameplay will get your blood pumping. Complete one career.

■ PH.D: *Pacific Fighters*

Find out for yourself how hard it was to land a crippled Corsair on a pitching and rolling WWII carrier deck in this gorgeous sim. Complete at least one dynamic campaign.

■ EXTRA CREDIT: *NASCAR SimRacing*

How well can you turn left? This deep sim will let you tweak just about anything a gearhead would want to tweak. Complete one NASCAR Series circuit.

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Gaming College

Battlefield 2

Guild Wars

Unreal Tournament 2004

Online For the social gamer in you

The thought of playing a static computer game against an AI opponent leaves many people cold. It's just not interesting if they're not playing against other human beings, which is what makes the online category of PC games so compelling. It's awesome to be able to jump into a fantasy world and explore with a party composed of your friends. Online-gaming skills are a vital ingredient in any expert gamer's repertoire.

Bachelor of Science: *Unreal Tournament 2004*

Speed is what this online shooter is all about, and it's also one of the easiest online games to get into—a few clicks, and you're fraggin'. Win 10 deathmatches.

Extra Credit: *Quake, Quake II, or Quake III: Arena*

The original online FPS series, you owe it to yourself to experience one of these games. Win five deathmatches.

Master's: *Battlefield 2*

Think *UT* but with a slower pace, modern weapons (including aircraft and tanks), and a total focus on team-play.

Ph.D: *Guild Wars*

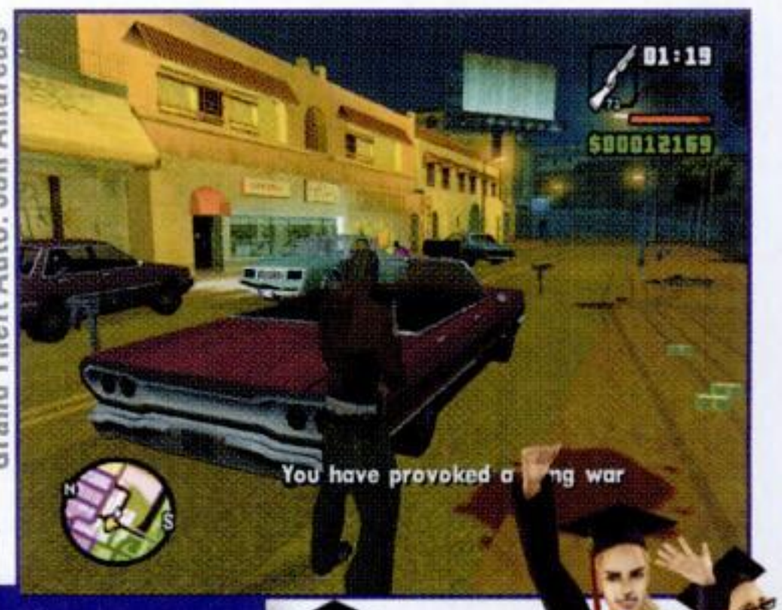
Guild Wars is one of the newest massively multiplayer online RPGs, and it's also one of the friendliest. Plus, there's no monthly subscription fee! Play it for at least 10 hours, and see if you can stop.

Extra Credit: *Star Wars Galaxies, World of Warcraft, EverQuest II*

Try at least any one of these three—each comes with 30 days of play time.

Psychonauts

Max Payne



Grand Theft Auto: San Andreas

Gaming Potluck When all other categories fail...

This category is for must-play games that just won't be pigeon-holed into one of the afore-mentioned genres, or for games that you really don't need to experience more than one of to understand their given niche.

Bachelor of Science: *Grand Theft Auto: San Andreas*

One of the most open-ended and controversial games ever, the latest *GTA* plays best on the PC.

Master's: *Max Payne, Max Payne 2*

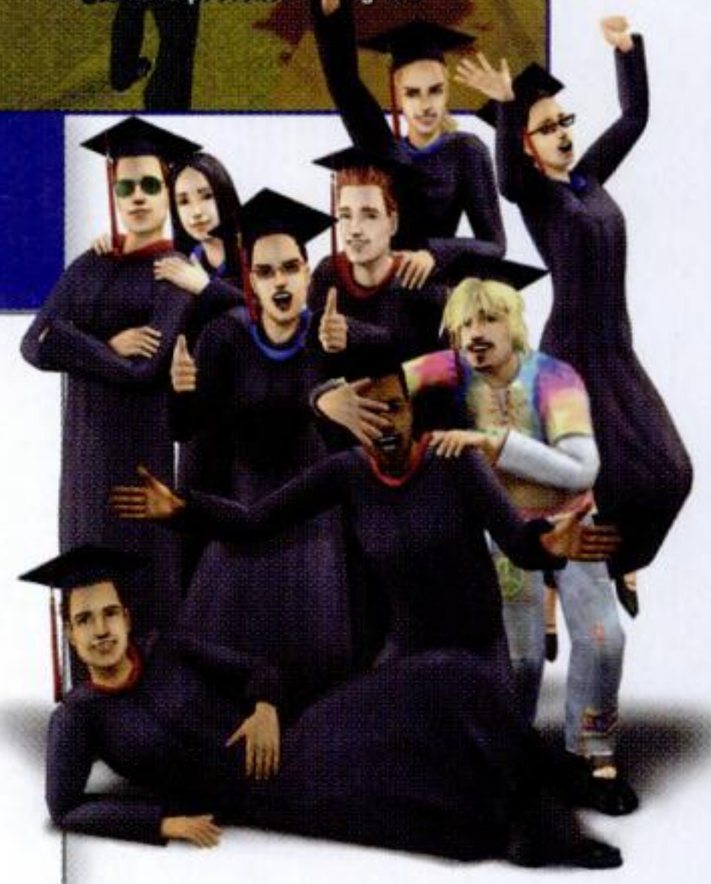
These gritty third-person shooters introduced "bullet-time" and a film noir–style treatment that's truly unique. Beat either in less than 10 hours.

Ph.D: *Psychonauts*

What other game allows you to wrestle with cats, terrorize tiny lungfish, direct a Broadway show, or dodge ordnance from heavily armed Girl Scouts? *Psychonauts* may be the most hilarious, imaginative, and entertaining platformer in history. Collect all 16 scavenger-hunt items.

Extra Credit: *MDK, MDK 2*

These quirky action games are full of zany characters, unique art and gameplay, and laugh-out-loud humor. Pick one and play it. ■



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It ain't even over yet, and 2005's already been a solid year for gamers! Join us as we look at every game Maximum PC has reviewed this year.

The Year in Games

Battlefield 2

Publisher: EA Games, www.eagames.com

Battlefield 2 brilliantly combines the fast pace and cohesive action of a small-squad game such as *Counter-Strike* with the grand scope and vehicular combat of the *Battlefield* titles.

When you first join a *Battlefield 2* server and pick your team, you must select a class. Different classes have different abilities and weapons: You can carry anything from semi-automatic sniper rifles to chain-fed machine guns. There are also several classes that fulfill support roles—healing teammates, repairing vehicles, and replenishing ammo. Dozens of vehicles are sprinkled throughout most maps, including planes, tanks, boats, helicopters, and even automobiles.

The object of the game is to capture and hold all of the spawn points on the map. If you take over all the enemy spawns, while defending your spawns you win the round. Lose the spawns, and you lose the round. The maps are huge, but unlike *BF:1942* maps, they're chock-full of choke points, which focus the battle into small, super-concentrated areas.

Controlling all the separate squads on your team is one all-powerful Commander. The Commander controls strategic battlefield resources—artillery, aerial drones, satellite scans, and supply drops—in addition to giving orders to individual squads. This player can also talk to the squad leaders, giving them instructions or a warning about incoming enemy concentrations.

A painfully slow server browser and the absence of a mechanism to get you playing with your buddies keep *Battlefield 2* out of 10/KickAss territory. But *Battlefield 2*'s combination of small-scale combat and large-scale strategy is damn fun, warts and all.

9 Verdict

3D Quotient: Smokin'

MATURE 17+

Blood and Gore
Intense Violence
Strong Language

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Brothers in Arms: The Road to Hill 30

Publisher: Ubisoft, www.ubisoft.com

Dear Mom and Dad,

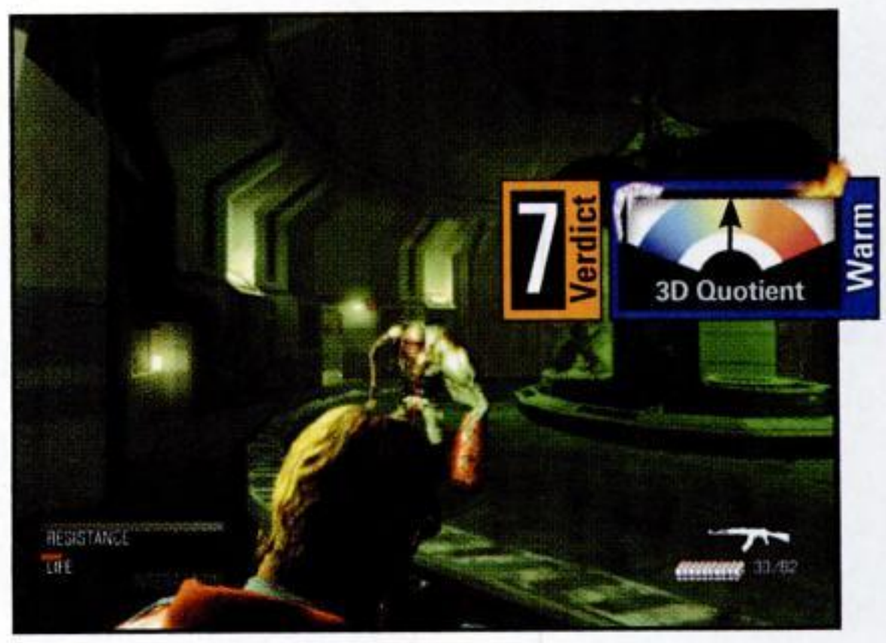
I don't know if I'm suffering from shellshock, but it's getting much harder to hit the Germans—that's right, I'm back in Europe fighting the Nazis again! I have to really take my time and aim to make each shot count. My squadmates tell me this is more "realistic" than the fighting I've done before, and I sure believe them! Apparently, I'm doing something right, though—the lieutenant just promoted me to squad leader!

Now that I have two squads under my command, I have to take a more strategic look at the battlefield. I'm using one squad as a fire team—they pin down Gerry with suppressing fire. Once the soldiers are pinned down and unable to return fire, I can send my assault team around the enemies' flank, letting them pounce on the unsuspecting Deutsch-heads and obliterate them with grenades or small-arms fire. It's a simple formula, really, but it applies to every single encounter we have here in the battlefield. It may be smart, but it's also a bit repetitive.

My other gripe about command is that the boys in my squad are a little dim. I never noticed it before I took over, but they need to be told *everything*. While my boys are busy suppressing and flanking, I usually settle down behind some cover and try to take out a few Krauts myself. These Germans might be a bit misguided, but they're difficult to kill when not suppressed, and they use cover effectively. I'd go so far as to say they're the smartest battlefield opponents I've ever faced! "Incoming!" Got to go...

Cold Fear

Publisher: Ubisoft, www.coldfear.com



Playing as action-starved Coast Guardster Tom Hansen, you're dropped onto an enormous Russian whaling vessel adrift in the Bering Sea in the midst of a torrential storm; a couple monster waves are all it takes to drag you overboard from the constantly listing vessel. This will turn out to be the least of your worries: once you scamper through blinding rain into the ship's interior, you'll find that an infection has mutated the crew into murderous, shambling zombies, and spawned a menagerie of horrors beyond imagining.

Yes, it's *Resident Evil* at sea, complete with the familiar cast (wisecracking hero, fearless female sidekick, remorseful scientist), the interminable loading screens, and plenty of scripted scares. But *Cold Fear's* gritty atmosphere succeeds too well to be judged as a mere *Resident Evil* knock-off.

Empire Earth II

Publisher: VU Games, www.empireearth.com

The History Channel may be popular, but really, where's the fun in watching file footage when you could be re-enacting key milestones in the rise of some of the world's most interesting empires? *Empire Earth II* lets you do just that, and the action is accompanied by a wealth of background info to establish the context of your missions.

Combat follows the staple rock-paper-scissors formula, with certain special leader units that enhance the overall abilities of your troops. It's solid, but nothing about the actual single-player combat really stands out. Thankfully, online skirmishes are a blast!

Freedom Force vs. the 3rd Reich

Publisher: Irrational Games/VU Games, www.freedomfans.com

Freedom Force vs. the 3rd Reich serves up a hot dish of furious strategic action anchored by one of the best video-game plots ever written.

For the uninitiated, this comic book–themed sequel is a squad-based strategy game played out in real time. You command a team of four superheroes determined to save the world from the unimaginable terror of nuclear threats, fascist armies, and zany villains. This game's strength is its story, as the developers managed to write a complex comic-book plot that interweaves new villains, time-traveling paradoxes, and disasters of cosmic proportions.

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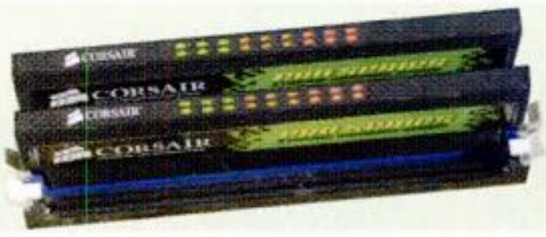

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Guild Wars

Publisher: NCsoft, www.guildwars.com

Guild Wars is an MMORPG "lite," offering much of the fun of class leaders *World of Warcraft* and *EverQuest II*, but without the bank-balance-draining monthly fee and the must-play-all-week requirement to advance.

The game ships cram-packed with quests and missions that can be undertaken alone or with other players. New content is already being added to expand the huge existing game world. Player-vs.-player gameplay is intense, with options ranging from simple arena combat to king of the hill, capture the flag, and of course, guild-vs.-guild battles. And the graphics are downright phenomenal.

Knights of the Old Republic II: The Sith Lords

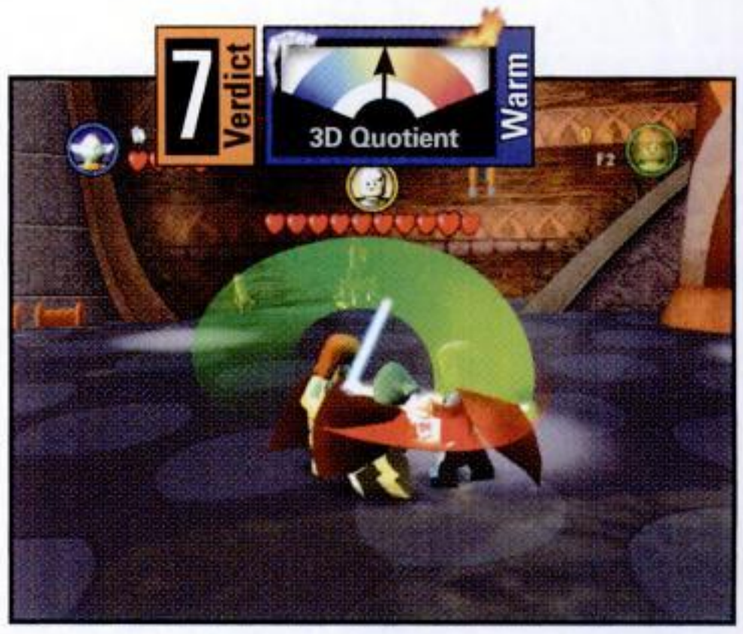
Publisher: LucasArts, www.lucasarts.com

Our Game of the Year for 2004, *Knights of the Old Republic* rekindled our love for captivating RPGs and delivered a perfect *Star Wars* experience. This sequel reprises the same formula—complex storytelling leavened with difficult moral choices—to great effect. Irritating bugs and a rushed ending dull its sheen (patches are now available), but the Force is still strong in *KOTOR II*.

An exiled Jedi who fought in the Mandalorian and Jedi Civil Wars, you're hunted by the Sith and an alliance of Bounty Hunters. As you journey, wayward travelers—each with a unique backstory—join you on your quest to rebuild the Republic and the Jedi Order.

Lego Star Wars

Publisher: Eidos, www.legostarwars.com



Lego Star Wars is like any other *Star Wars* game, but everything in this game is built from Lego blocks. That's right: world geometry, vehicles, even the characters you play are built from small, colorful interlocking modules. Using the Force, you can break down and rebuild many objects—after all, they're made from Legos—in order to complete puzzles as you progress through the story arc of all three prequel movies.

Unlike most platformers, in *Lego Star Wars* you always have multiple characters available to complete your missions. Everyone from Obi-Wan Kenobi to Count Dooku is available—and more than 30 characters can be unlocked by successfully completing missions and collecting items.

If not for a few bugs and the game's short length (5 hours or so), we'd have liked it better.

The Matrix Online

Publisher: Sony Online Entertainment, www.soe.com

In this MMO you play as a Redpill—someone who has chosen to "wake up" inside the artificial world of the Matrix. You begin as an agent of Zion, but over time you might choose to ally yourself with the Agents or the exiled Merovingians. The missions, leveling, and exploration are standard MMO fare. The game world has the look and feel of the movies, from the lighting to the actual locations you'll visit.

What's always been intriguing about the Matrix is the way "awakened" operatives could manipulate reality, and some of this manipulation made it into the game. Running fast, leaping far, and mastering complex fighting styles are in the game, but you won't be running across walls or dodging bullets. As for the bullet-time effect, you're able to use it for fighting but it's nowhere near as satisfying as in the movies. The game's worst fault is its buggy, repetitive nature—and sparsely populated servers.

One thing that *MxO* gets right is the turn-based combat system. It's unique in the history of massively multiplayer games and allows for elaborate, exciting-to-watch combat animations. Unfortunately, the poor camera controls and the complete inability to fight more than one enemy at a time (though multiple enemies can attack *you*) ruin the experience.

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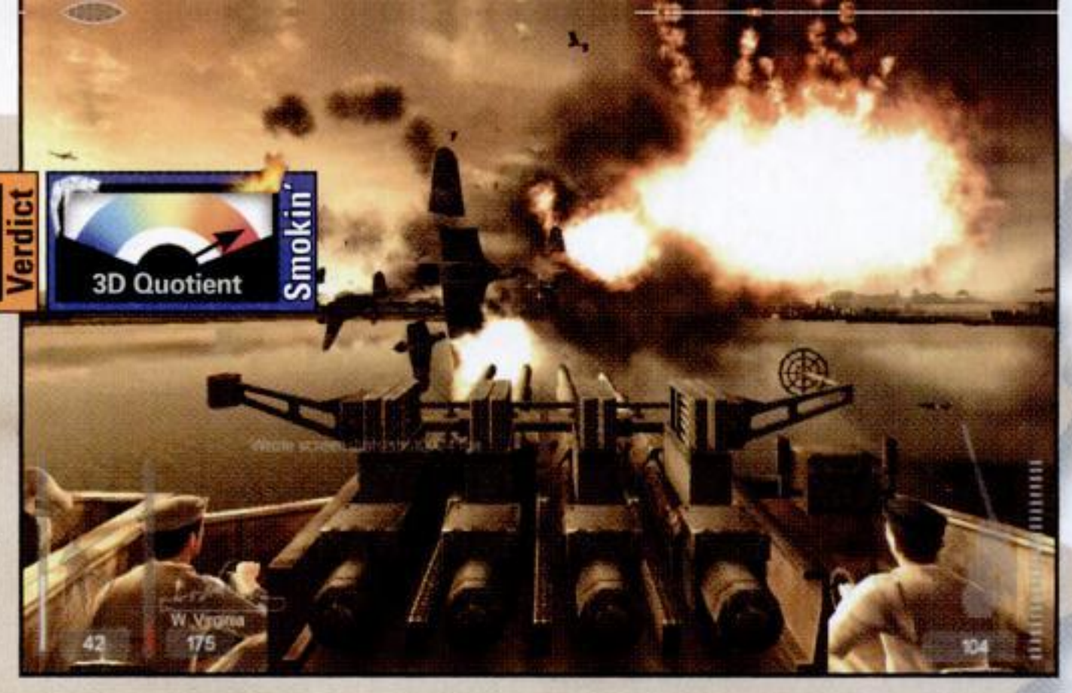
Medal of Honor: Pacific Assault

Publisher: EA, www.eagames.com



Dear Mom and Dad,

I can't say exactly where I am right now, but after the attack on Pearl Harbor, my platoon got shipped all over the Pacific, including Guadalcanal and Tarawa.

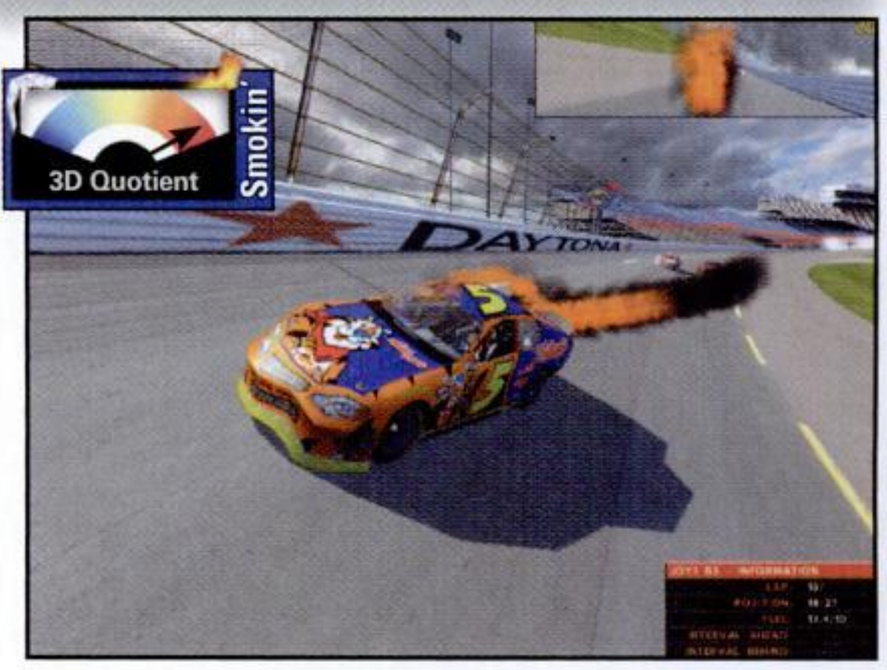
I know war should never be entertaining, but the boys and I sure had a lot more fun in Europe fighting the Germans. After the first two or three hours, all the jungles have started to look the same. That's OK though: there's no time for sightseeing because the Japanese are a lot tougher to fight than the Germans. They try to flank us, they use cover, and when they get close to us, they charge with their bayonets, screaming "Bonzai!"

It's not all jungle patrols here. Occasionally the boys and I get to lay into the enemy with heavy weapons like .50-caliber machine guns, mortars, and even portable artillery. I even got to fly a plane, and I managed to sink an aircraft carrier and a destroyer all by myself!

Maybe it's the jungle heat, but I feel a lot slower here in the Pacific. In Europe I could run fast and aim quickly without any delay. Here I run slowly and my rifle arm is sluggish. Sometimes I take enemy fire longer than I should while lining up a shot. Don't worry, Mom: I've never been hit with anything that Jimmy, our corpsman, couldn't patch up in a few seconds.

NASCAR SimRacing

Publisher: EA Sports, www.easports.com



SimRacing is big and brash, and it brings a new level of realism to the track that gearheads will relish. The game boasts 25 official NASCAR circuit tracks (plus three fictional tracks) and some five dozen rides and drivers spanning the three prominent NASCAR series: Craftsman Truck, Nextel, and National. The tracks look resplendent, with real-time weather effects and grandstands brimming with enthusiastic fans. Add stellar sound—particularly if you have a decent 5.1 speaker system—and it's like you've got a driver's-eye view of the Daytona 500. You can also race against up to 42 human drivers online via EA.com or a LAN.

Pacific Fighters

Publisher: Ubisoft, www.ubisoft.com

It's from the makers of *Il-2 Sturmovik*, so it should come as little surprise that *Pacific Fighters* is the best Pacific Theater aerial combat sim since Microprose's classic *1942: Pacific Air War*.

Hellcats, Corsairs, and Zekes are the stars here—the list of flyable American and Japanese fighters and multi-station bombers in *Pacific Fighters* tops out at over three dozen—and the exhaustive level of detail on each plane is truly mind-boggling. (Sadly, no torpedo bombers are featured.) Downed fighters break apart and gout flames realistically as the sim's sophisticated damage model shrewdly distinguishes between a few stray bulletholes and a major fuel tank or engine strike.

Pariah

Publisher: Digital Extremes, www.digitalextremes.com

Pariah is a better game than its first 30 minutes indicate. Unfortunately, we found those first 30 minutes so annoying that getting to the rest of the game was a genuine challenge.

Graphically, *Pariah* is borderline luscious, with detailed models, gorgeous landscapes, and plenty of stuff to blow up. The special effects are killer, too: On a second pass through one of the earliest levels in the game, we discovered that chucking a grenade into the foundation of a mammoth concrete tower brought the entire edifice down.

Regrettably, there's no real storyline behind the carnage: You have only the vaguest idea of who you are, who's trying to kill you, and what you're supposed to do.

Prince of Persia: Warrior Within

Publisher: Ubisoft, www.princeofpersiagame.com

In last year's *Prince of Persia: The Sands of Time*, the Prince was one cool dude, kicking ass with style and grace in a resplendent 3D world that brimmed with challenging environmental puzzles. It was a stunning, rousing success...on the consoles, that is. *Sands of Time* may have looked the best on a PC, which is to be expected, but it played the worst—thanks to abysmal out-of-the-box gamepad support.

Warrior Within rectifies the gamepad oversight and most of our other complaints about *Sands of Time*. Gone are repetitive combat (enemies no longer respawn when you enter a room) and the irritating save-point system. However, the biggest improvement is the new "button-mashing free" control scheme: You can now execute precise combos on multiple enemies using any dual analog controller.

Silent Hunter III

Publisher: Ubisoft, www.ubisoft.com

Immersive, atmospheric, enthralling—pick an affirmative adjective and it'll likely stick to Ubisoft's *Silent Hunter III* like a magnet to steel. In fact, this WWII U-boat simulation is so good it could single-handedly rescue the long-floundering simulation genre.

SH III maps the entire Atlantic Theater, and this massive oceanic environment teems with *hundreds* of independently generated merchant and naval vessels. As the war progresses, North American supply convoys will entice you into opportunistic torpedo attacks while their shepherding destroyers employ intelligent and cunning tactics to locate and destroy you. Individual career patrols can last weeks, and nothing drives home the tension of U-boat command like the rapid-fire sonar pings from a hovering Flower-class Corvette (who's still pissed about the two tankers you torpedoed) as you nervously flee to hull-popping depths.

Psychonauts

Publisher: Majesco, www.psychonauts.com

Some kids can play a Chopin Mazurka just by listening to a recording of it. They go to Julliard. Other kids can blast a squirrel into a few clumps of loose fur and gristle with nothing more than a thought. They go to Whispering Rock Psychic Summer Camp, where tots with paranormal gifts receive training to harness and control their PSI powers (including levitation, telekinesis, and clairvoyance) in hopes of one day joining the elite group of secret agents known as *Psychonauts*.

You play as ambitious Rasputin—or "Raz"—for whom even a few days at Whispering Rock is a dream come true. That is, until his camp buddies transform into drooling, TV-addicted morons. For this there can be only one credible explanation: someone's been stealing their brains—and Raz sets out to find out who by exploring everyone's minds.

The voice acting is superb, and the story is more satisfying than those in most Hollywood movies. *Psychonauts* is the most unpredictable, hilarious, and—what the hell, we'll say it—mind-blowing action-platformer ever made.

Sid Meier's Pirates!

Publisher: Atari, www.atari.com

It may seem like it on the surface, but *Sid Meier's Pirates!* is not some unholy union of *Age of Sail*, *Sea Dogs*, and *Dance Dance Revolution*. It's something else. "Live the Life," the game urges as it opens, and that's what it offers: the life of a pirate presented as a single tapestry woven from disparate pieces.

The core of the game is a sun-drenched map of the Caribbean, and you make calls at foreign ports, refit and repair your ship, take to sea for battles, sell cargo, take on jobs, talk to the governor, visit taverns to buy or cajole information or objects, hire on new crew, and repeat until your men become so pissed-off (and they will) that you have to sell everything and start again. *Pirates!* is never less than completely addictive. Even the slightly silly dancing and fencing sequences are entertaining!

The Year in Games

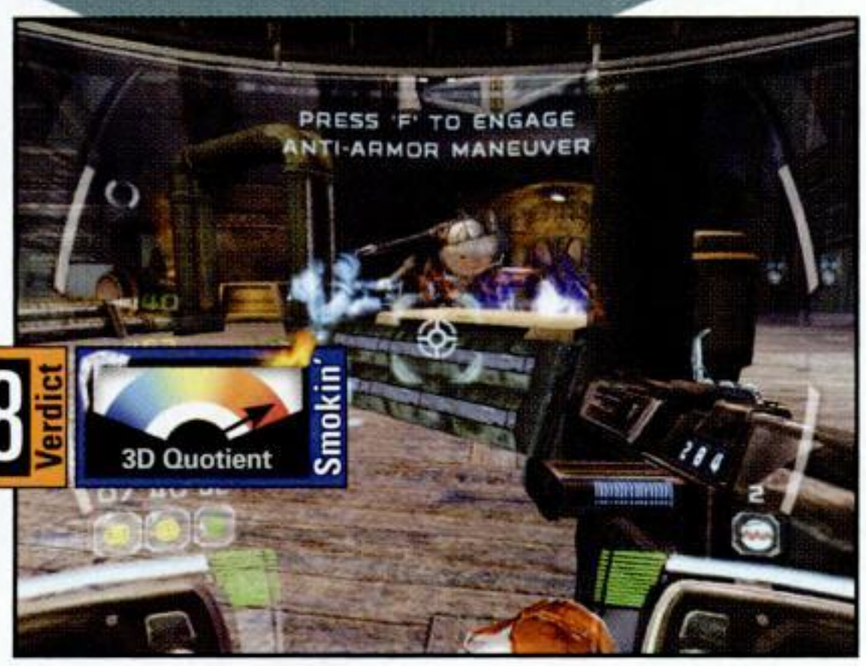
MAXIMUM PC KICK ASS PRODUCT

Splinter Cell: Chaos Theory

Publisher: Ubisoft, www.ubisoft.com

The original *Splinter Cell* reinvented the stealth shooter. Its sequel, *Pandora Tomorrow,* delivered a near-perfect objective-based multiplayer mode. Now, *Chaos Theory* takes the best from its two predecessors to deliver a game that's superior to both. With an inspired single-player campaign, more of the same spy-vs.-mercenary multiplayer, and a brilliant co-op mode, *Chaos Theory* really delivers.

We're pleased to report that the single-player portions of *Chaos Theory* are much more forgiving than in previous iterations. And the brand-spanking-new two-player co-op mode is exactly what co-op should be. Instead of simply chucking two people into a single-player mission, Ubisoft Montreal built four exquisite new missions specifically designed for co-op play—and they're not to be missed. Simply put, *Chaos Theory* is the best installment of *Splinter Cell* yet. No serious gamer should miss it.

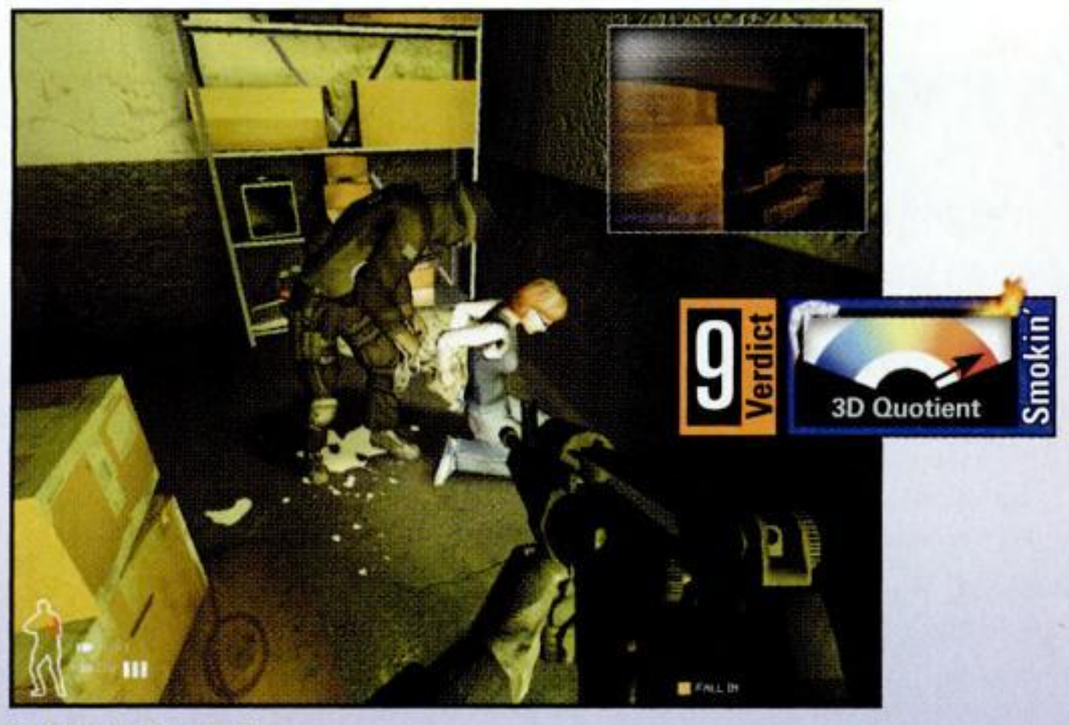


Star Wars: Republic Commando

Publisher: LucasArts, www.lucasarts.com

One of the only entertaining elements of the *Star Wars* movie prequels is the climactic battle in *Episode II.* The sight of thousands of clones attacking a massive droid army boils our noodle. *Republic Commando* puts you in the space-boots of an elite clone commando. Your mission: defeat the Republic's enemies with the help of your clone "brothers."

The game is surprisingly fun, despite the simplistic enemy and squad AI. The level design makes excellent use of the Unreal engine, with high-resolution textures, lots of destructible geometry, and objects you can use for cover damn-near everywhere. The animation is extremely good, with none of the skating models that seem to plague many other Unreal-based games.



SWAT 4

Publisher: VU Games, www.swat4.com

Though the first three *SWAT* games were squad-based and heavily strategic, a la *Rainbow Six,* this fourth installment is more Hollywood action movie than sim. Despite the change in tack, the game remains focused on having you learn and apply authentic SWAT tactics while participating in hair-raising real-world SWAT scenarios.

The game's 14 independent missions require you to lead your squad through dripping-with-sweat situations ranging from hostage scenarios to diamond heists to underground casino busts. Random enemy placement and robust multiplayer modes add lots of replay value, and the new co-op mode kicks ass.

The Chronicles of Riddick: Escape from Butcher Bay, Developer's Cut

Publisher: VU Games, www.vugames.com

Cronicles of Riddick is a surprisingly enjoyable game that mixes traditional stealth gameplay with RPG-like character interaction to create a first-person experience that delivers equal amounts stealth and action.

Imprisoned in a super-penitentiary, Riddick must interact with the NPC inmates and guards to procure items such as weapons, cigarettes, and cash. Naturally, Riddick will frequently need to smash skulls, which an intuitive melee combat system makes easy. Unfortunately, the enemy AI is the game's weakest link—these NPCs are pretty much as dumb as the cement they stand on.

However, we dig the way *Riddick* mixes disparate genres enough to forgive this weakness—and its woefully short 12-hour playtime.

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Tri Huynh
Senior Engineer, Corporate IT
NVIDIA

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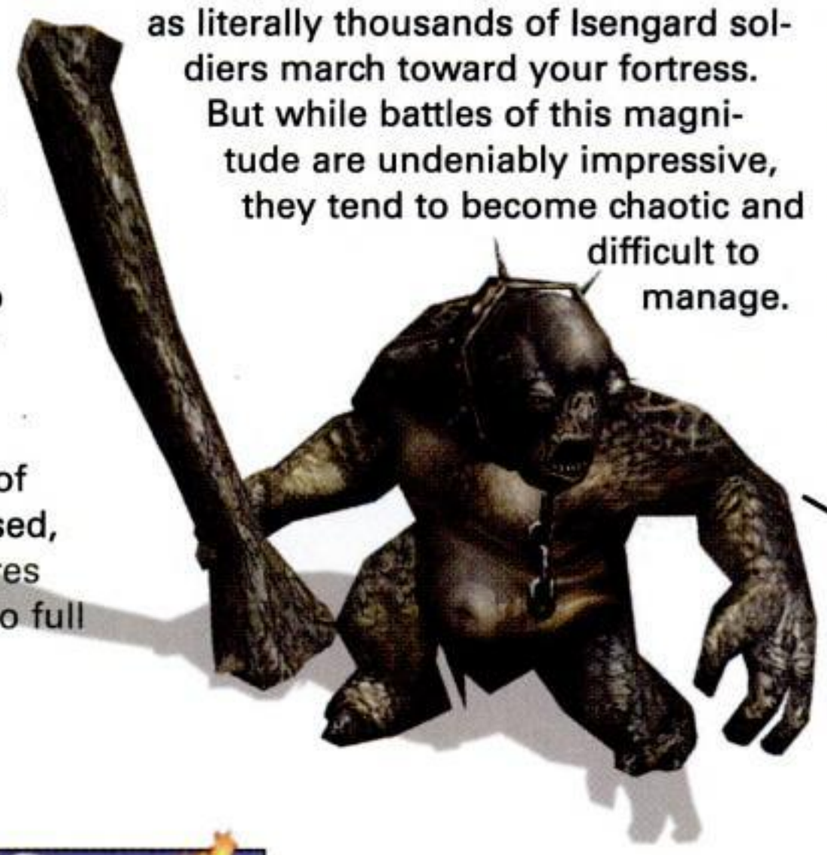
The Lord of the Rings: The Battle for Middle-Earth

Publisher: EA, www.eagames.com

8 Verdict | 3D Quotient: Smokin'



"Momma said: Walk tall, carry big stick!"

The Battle for Middle-Earth features three modes of gameplay: campaign, skirmish, and multiplayer. The latter two are worthwhile, but the real star of the show is the single-player campaign, where you choose between good and evil, then fight through the entire *Lord of the Rings* storyline. The game's script stays mostly true to the films', though there are occasional deviations.

The single-player campaign is long and satisfying, with dozens of missions for each side. As promised, *The Battle for Middle-Earth* features deliciously massive battles that do full justice to the films. Playing the forces of good during the siege of Helm's Deep, you can't help but cower in awe as literally thousands of Isengard soldiers march toward your fortress. But while battles of this magnitude are undeniably impressive, they tend to become chaotic and difficult to manage.

The Sims 2: University

Publisher: EA, www.eagames.com

7 Verdict | 3D Quotient: Smokin'

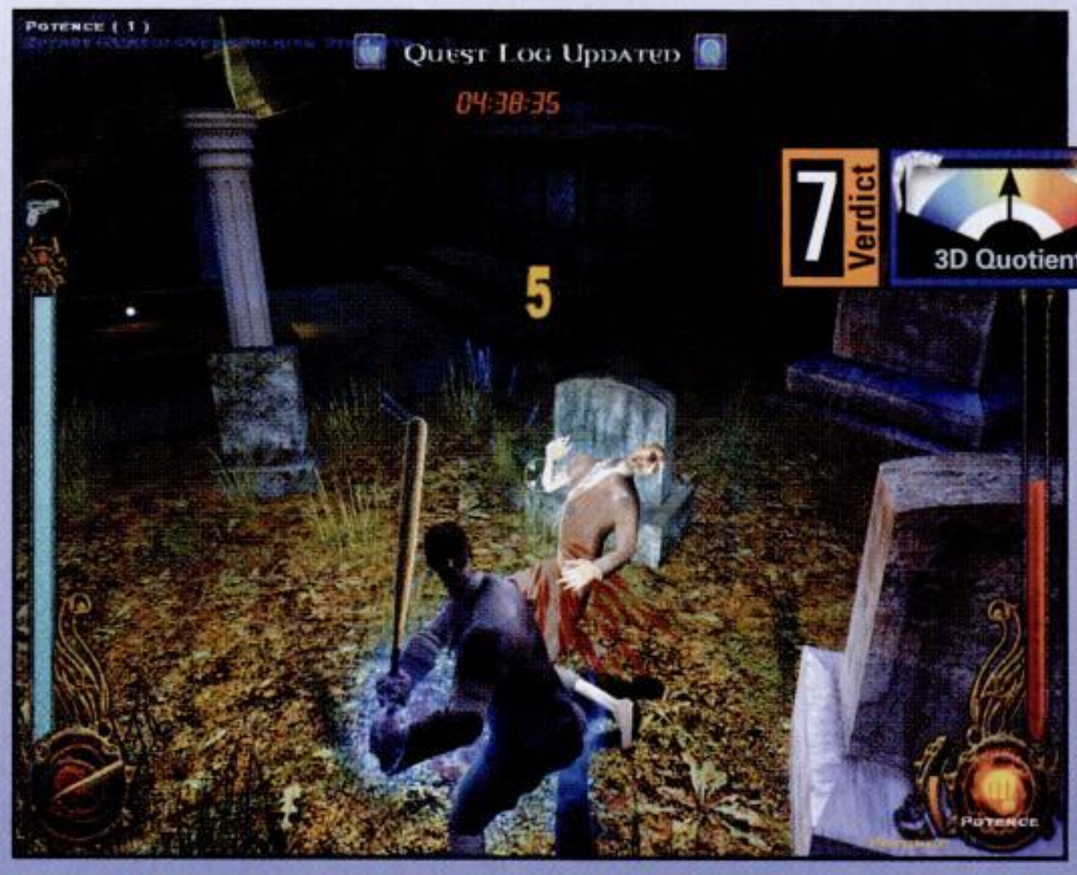
You can play this first expansion pack for *The Sims 2* any way you like: You can relive your college experience, or you can create the college experience you *wish* you had.

You can ditch class and lounge around your dorm or campus hotspot and try to lure hotties back to your Jacuzzi-equipped crib until you get kicked out of school. Or you can study like mad, make the Dean's list, and graduate with honors—carrying your rewards over into a new Sim career.

Unfortunately, you never see the inside of a classroom, and the whole scholastic side of the game is woefully under-developed. And the game performs abysmally on high-end machines, let alone anything approaching the minimum specs.

Vampire the Masquerade: Bloodlines

Publisher: Activision, www.vampirebloodlines.com



As a victim of the "Embrace," you've been turned into a vampire against your will. When your vampire patron is decapitated, you're given pardon by the controlling sect of vampire clans, with the opportunity to prove your usefulness to the vampiric community.

As you perform numerous quests throughout the 30-hour single-player game, you'll discover the secrets and conspiracies brewing among seven opposing vampire clans. The conversation is sharp and often witty, and there are enough optional quests to boost your experience and double the minimum length of the game.

Sadly, when the going gets rough, *Bloodlines* falters. Combat is more dependent on your fighting skill levels than on your twitch skills.

Despite the fact that the graphics never make the most of *Half-Life 2's* Source engine, and other flaws in the game's execution, *Bloodlines* still offers some great role-playing elements.

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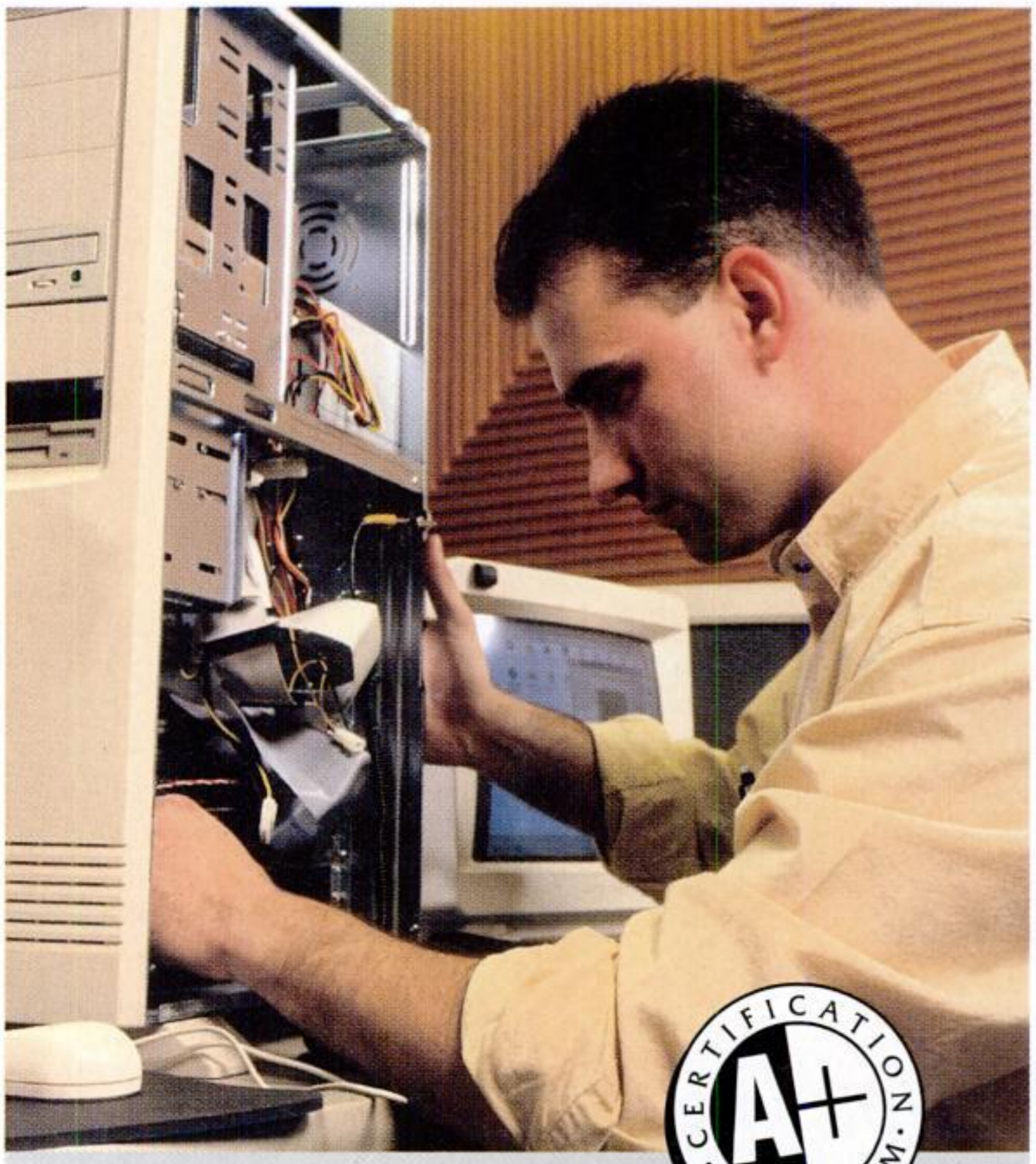

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Doom 3: Resurrection of Evil

Publisher: Activision, www.doom3.com

In *Resurrection of Evil*, designer Nerve Software takes the ball that id dropped and feebly kicks it around in the dark for—well, let's say six hours. Another romp through the cramped corridors of the infamous Mars research facility will certainly please fans of the first game, but won't convert those left cold by *Doom 3*.

Full Spectrum Warrior

Publisher: THQ, www.fullspectrumwarrior.com

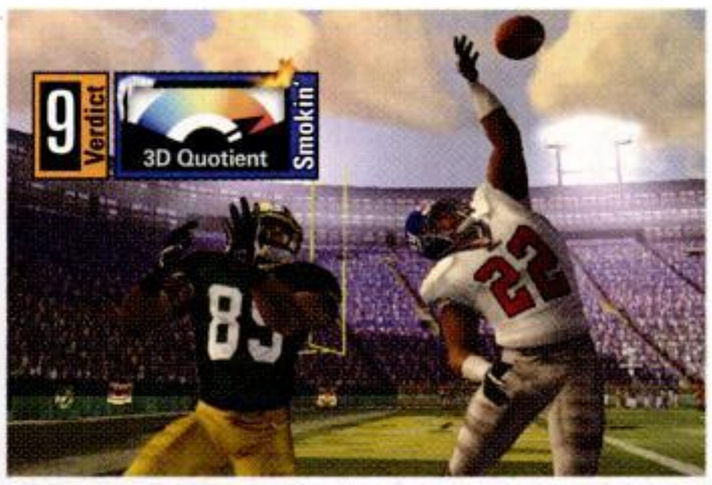
Originally designed as a training tool for U.S. infantrymen, *Full Spectrum Warrior* is all about gritty realism in its depiction of modern-day urban combat.

Sadly, the ultra-realistic presentation, solid AI, co-op options, and palpable realism and tension can't quite overcome the hyper-repetitive gameplay.

Grand Theft Auto: San Andreas

Publisher: Rockstar Games, www.rockstargames.com

San Andreas comes together in ways the previous two *Grand Theft Auto* games never did, stripping out party-pooping frustrations (such as the dreadful RC 'copter mission in *Vice City*), or at least making them elective, while expanding on RPG elements. We're hooked on the stylish way it evokes criminal thrills in a vast and immersive virtual world.



Madden 2005

Publisher: EA Sports, www.easports.com

The evolution from *Madden 2003* to *Madden 2004* represented a quantum leap—a redshift of sorts that resulted in the finest football game ever. While not putting forth as dramatic an improvement, *Madden 2005* adds some unique new gameplay (and play-calling) controls that reinforce its reputation as the ultimate football game.

Playboy: The Mansion

Publisher: Arush Entertainment, www.playhef.com

As huge fans of *The Sims* franchise, as well as of the female form, we figured any game that could blend these disparate elements into an interesting mixture of business simulation and exhibitionism would be pretty decent. Boy, were we wrong.

RollerCoaster Tycoon 3

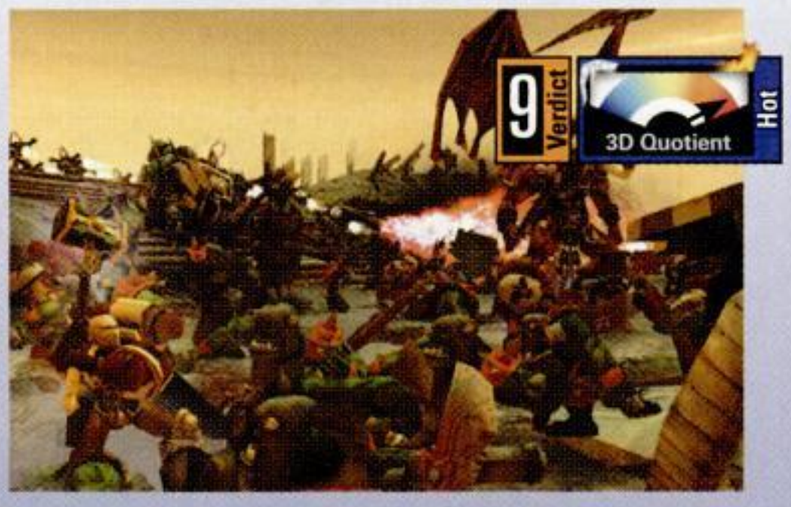
Publisher: Atari, www.atari.com

In *RCT3*, not only can you ride an astounding lineup of steel and wooden coaster types, but you can also experience any ride in your park from a first-person perspective. Unfortunately, the game was also shipped with a lot of minor but annoying bugs.

Scrapland

Publisher: Enlight, www.scrapland.com

A sort of *Grand Theft Auto* in space, *Scrapland* serves up a few memorable moments, and its art style and premise are interesting. Regrettably, the game's missions and combat are bland and repetitive, and the game fails to deliver *GTA*-style thrills.



Warhammer 40,000: Dawn of War

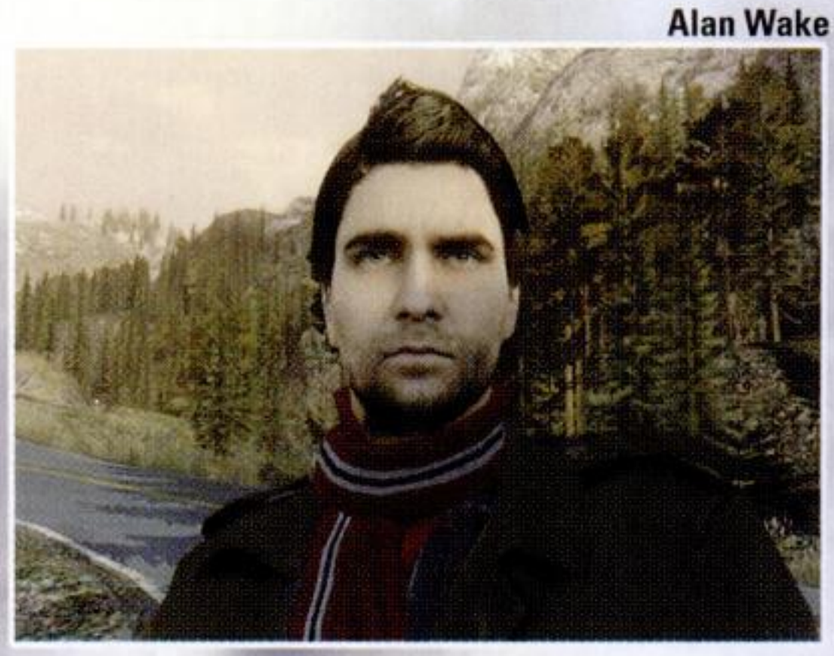
Publisher: THQ, www.relic.com

Genre-bustin' visuals, unique units, sweat-inducing strategic gameplay—this RTS has it all. Better still, it puts the *Warhammer* license to excellent use, which fans will appreciate. We just wish it were a bit longer.

Supreme Commander

Rise of Legends

Alan Wake



COMING

Unreal Tournament 2007

Enemy Territory: Quake Wars

Quake 4

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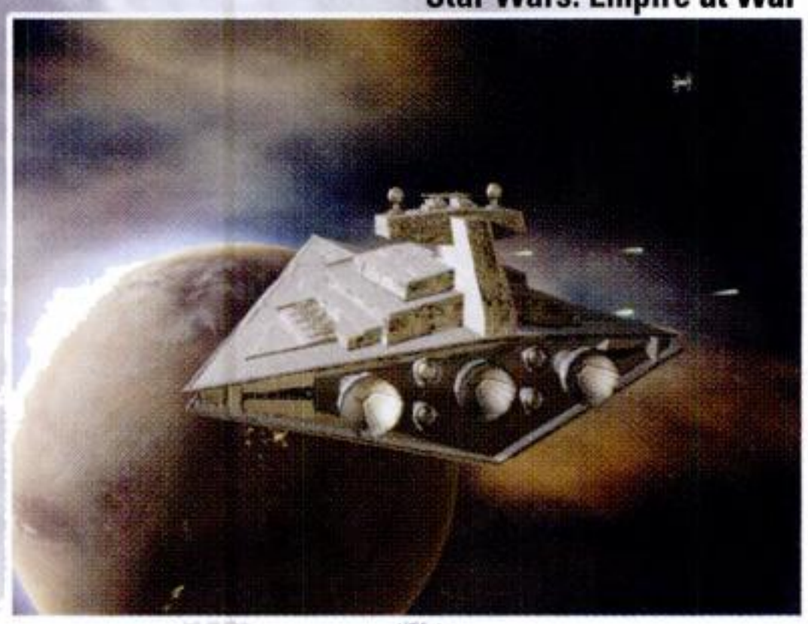
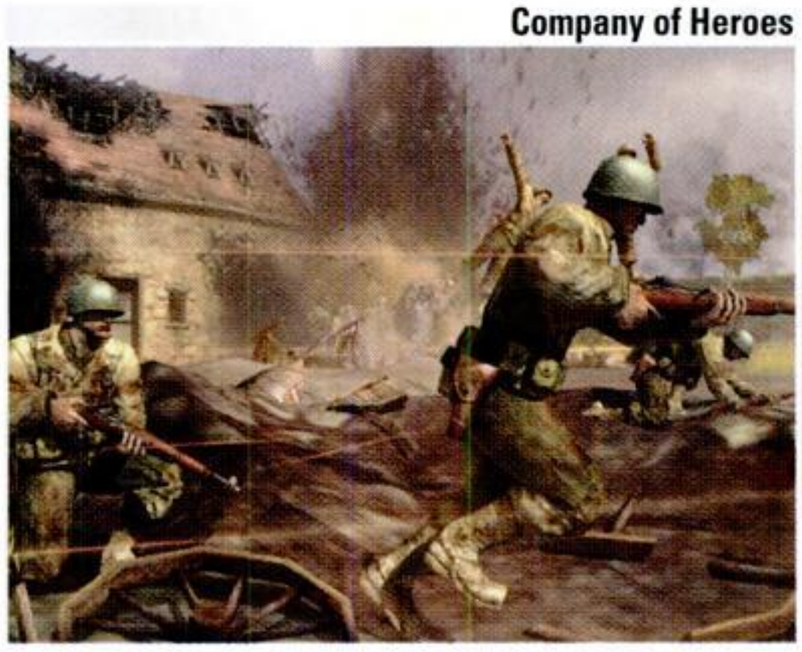
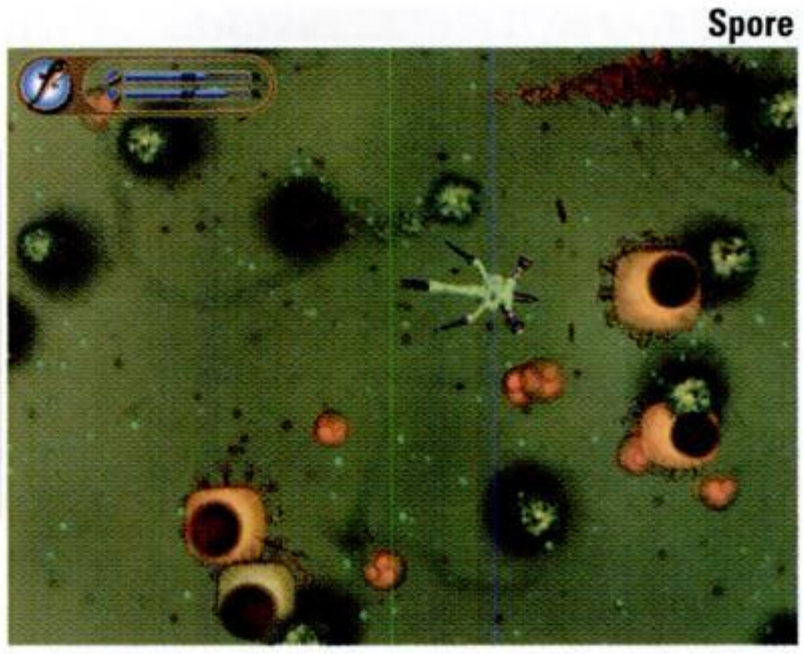


Star Wars: Empire at War



Company of Heroes



Spore

Why do you need all this fancy PC hardware? For the games, of course! We give you a sneak peak at the most promising—and resource-gobbling—titles in development.

ATTRACTIONS

Supreme Commander

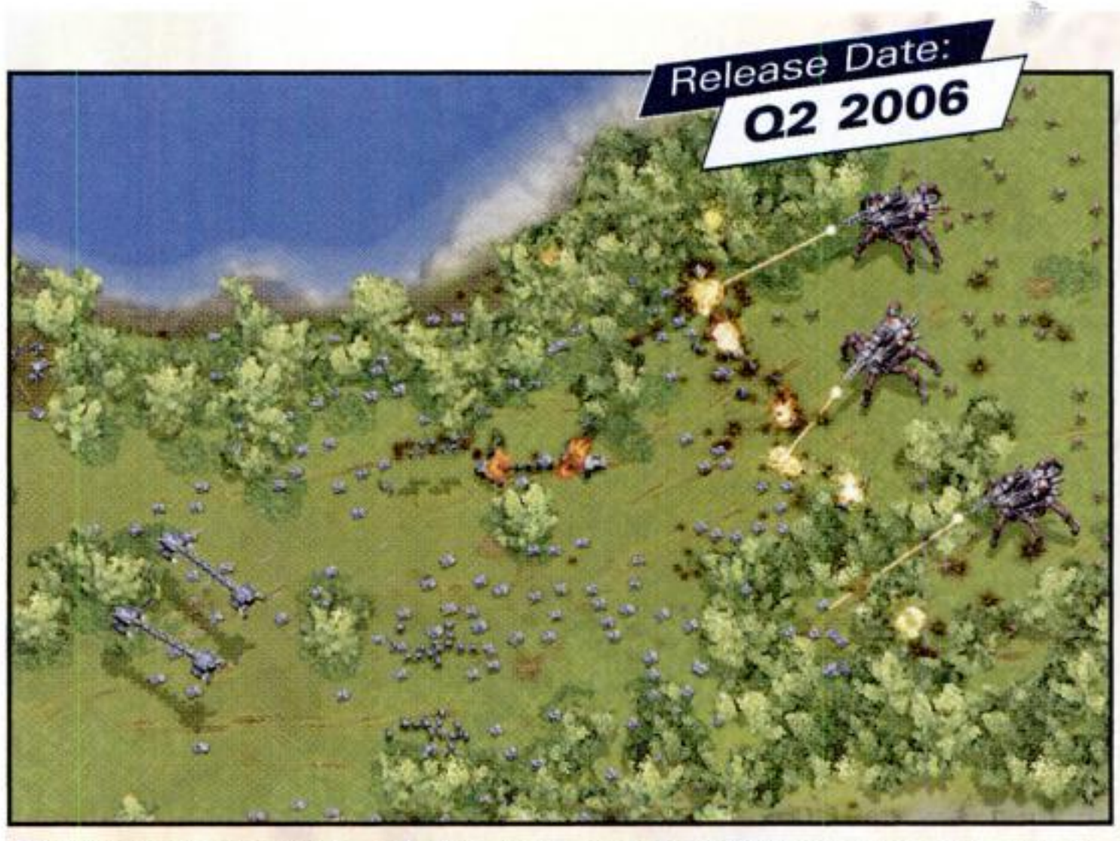
The maker of *Total Annihilation* sets his eyes on the RTS once again

Chris Taylor's *Total Annihilation* is one of our favorite RTS games of all time—and one you need to play if you want to call yourself an expert on the genre (see story, page 63). So, to say we're excited that Mr. Taylor—now with his own company, Gas Powered Games—is doing a spiritual successor to *TA* would be a severe understatement. We're drooling over this one!

Supreme Commander is, of course, a real-time strategy game that's set in the distant future—however, it retains the flavor of current-day warfare. Its chief innovation is a strategic-level perspective that allows you to view the entire theater of war, commanding at the grand-strategic level (you are a "supreme commander," after all) while letting you zoom in to take charge of tactical-level battles when you so desire. Unlike the *Total War* series, where you played the grand-strategy from a separate map and then loaded into individual battles, *Supreme Commander* presents a seamless real-time world in which you can quickly zoom from a satellite-level view (where entire armies are presented as icons in motion) down to the ground level (where individual units are being shredded on land, sea, and in the air).

The sense of scale the game portrays is another innovation—battleships will be two screens in size at the closest level of zoom, for example. (Zoiks!) The scale of individual units is best appreciated as they interact in combat. Immense spiderbots crawl across the battlefield as smaller units scurry around beneath them and between their legs. It's warfare as a collision of monumental levels of power, from the minuscule to the massive, all of it directed from the perspective of godlike commanders who can zoom out to experience the conflict at the level of X's and O's.

And you can bet that *Supreme Commander* will require a Supreme PC—we'll be ready!



The immense scale of the units and ability to zoom in and out of the action will surely tax your PC

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Test-Driven: Quake 4

Not only did we score a briefing on one of the hottest upcoming games, we got to play it too. And, we've been given G14 clearance to share the intel with you.

It's been a long time since we kicked some Strogg ass—too long, in fact. So we were totally stoked to kick some more when Activision came by recently with a brief *Quake 4* single-player demo. (Warning: Minor spoilers ahead!)

The game, which is being created by Raven Software, continues where *Quake II* left off, and it is very reminiscent of the beloved 1997 frag-fest. We're pleased to say that *Quake 4* boasts a healthy dose of that familiar guns-a-blazin' gameplay associated with id-branded games—along with some sweet new twists that should breathe new life into the franchise. Though we were only able to sample the wimpy Blaster and semi-powerful machine gun, word on the street is there will be a very healthy cache of weaponry, including the almighty BFG.

The biggest change, of course, is the usage of the *Doom 3* engine, which makes the game look a lot like, well, *Doom 3*. The engine has been tweaked to allow for the creation of large outdoor areas. However, the one outdoor level we played was a *Far Cry* from other games in that it consisted of a barren moonscape rather than a dense jungle or debris-filled, war-torn WWII battlefield.

The tried-and-true *Quake*-style gameplay will appeal to those with itchy trigger fingers and a hankering for "shoot first, don't ever ask any questions" first-person action. Adding to the intensity this time around is a team of fellow soldiers who battle the Strogg alongside you; and there are vehicle-based missions in which you'll get to pilot hovertanks and even Mechs. Also, early on in the game you are captured by the Strogg and are semi-transformed into one of them (taking on some of their abilities in the process).

***Quake 4* feels a lot like a more frenetic *Doom 3 only* with larger outdoor levels, and drivable vehicles—and even more blood!**

Officially the game will be released "when it's done." However, our spidey sense tells us we'll be hip-deep in Strogg blood this holiday season!

Enemy Territory: Quake Wars

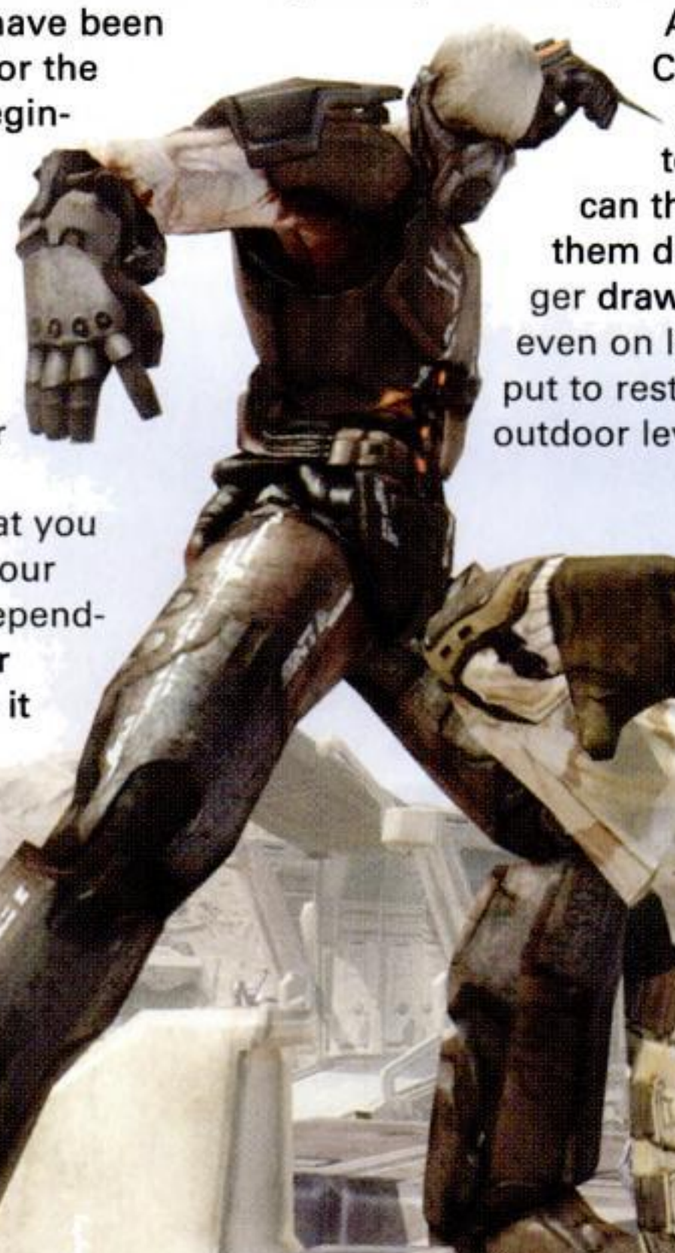
id's franchise is getting set to take on Battlefield 2 for your online time

Applause. That's the sound you heard from our offices when Activision released *Wolfenstein: Enemy Territory* (2003), formerly intended as a retail expansion pack, onto the Internet as a free standalone game. Now that our appetites have been whetted for more, id and Activision have big plans for the *Enemy Territory* name — namely, a new franchise beginning with *Enemy Territory: Quake Wars*, a melding of *Quake* and, well, *you know*. Think *Battlefield 2* invaded by Strogg and Space Marines!

The *Doom 3* engine–powered *Quake Wars*—being developed by *Enemy Territory* creator Splash Damage—carefully sidesteps competing with *Quake IV* by focusing on an intense, cooperative multiplayer battle experience. When you join a team, the game will figure out the single best task (or list of tasks) that you should perform at that moment in accordance with your class choice. Suggested priorities will be dynamic, depending on what's happening in the battle and where your troops are positioned. This setup will hopefully make it easier for the casual gamer to jump into a game.

Several different character classes will be available. As a human construction engineer, for example, you'll be able to deploy useful battlefield objects, such as gun turrets, that other players can use. Strogg meditech equivalents, on the other hand, can create Strogg spawn points out of injured human players before they can be healed by their own medics. Imagine a new enemy Strogg exploding out of your fallen corpse, and you'll understand how powerful (and strategically important) this ability can be.

Another big selling point will be John Carmack's new "MegaTexture" technology, which effectively plasters the terrain with one *huge* texture the devs can then "paint" different portions of, giving them distinct properties. The result? Much longer draw distances that will be easily rendered, even on lower-end hardware. (This game should put to rest the stigma that id engines can't handle outdoor levels.)



The *Quake* universe has always been about combat. Now it's about war!

Release Date:
When it's done!

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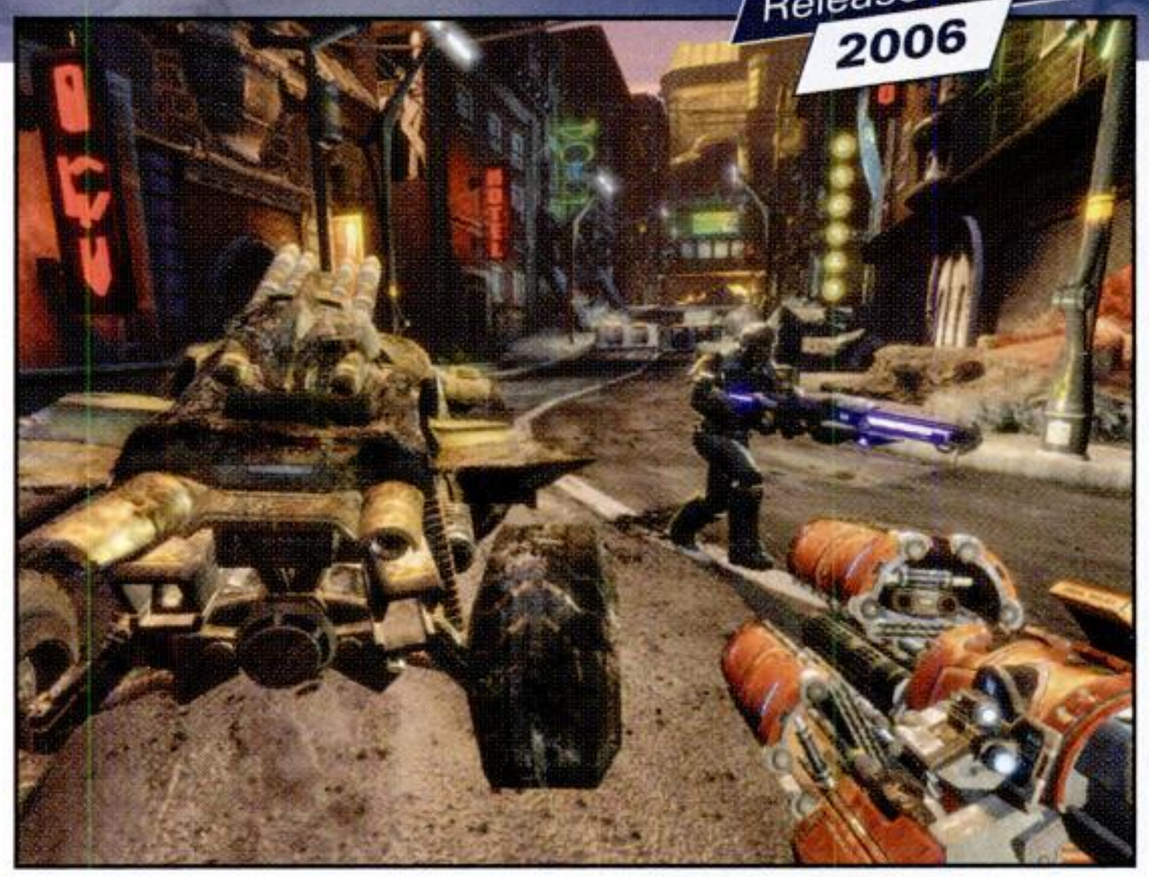
Unreal Tournament 2007

Epic radically improves the sport of Intergalactic Sport Killing



Based on the Unreal Engine 3, *UT 2007* will make the most out of what your PC's hardware has to offer.

How do you one-up *UT 2004's* breakneck action and bizutt-load of gameplay options? We weren't sure it'd be possible, until we saw *Unreal Tournament 2007* in action.

Aside from the staggering graphics (courtesy of the Unreal Engine 3), Epic is promising significant enhancements in bot AI. "Fewer than 25 percent of the people who bought *UT 2004* ever went online with it," reveals Steve Polge, the game's lead designer. (This figure was ascertained via server stats.) So the team is working to code bots that are significantly more realistic: they'll banter with each other, and better yet, they'll accept and respond to location-specific voice commands.

Example: An outdoor corridor needs monitoring. You've got to clean out a nearby tower, so you tell an AI squadmate, "Cover the corridor." In the middle of tower-storming, you want an update, so you ask, "Is there anyone in the corridor?" The bot will reply back and tell you "The corridor is clear."

The primary new game mode will be Conquest — or, as Polge puts it, "Onslaught meets Assault." In Conquest, you and another team will vie for control of strategic objectives on an enormous map (several times the size of a typical *UT* map), and new objectives will open up during the battle.

Continuing the franchise's focus on modding, *UT 2007* will ship with "all the tools we use to make the game," says producer Jeff Morris, and possibly a feature to auto-download popular mods as well.

Alan Wake

Another dark action-fest from the makers of *Max Payne*

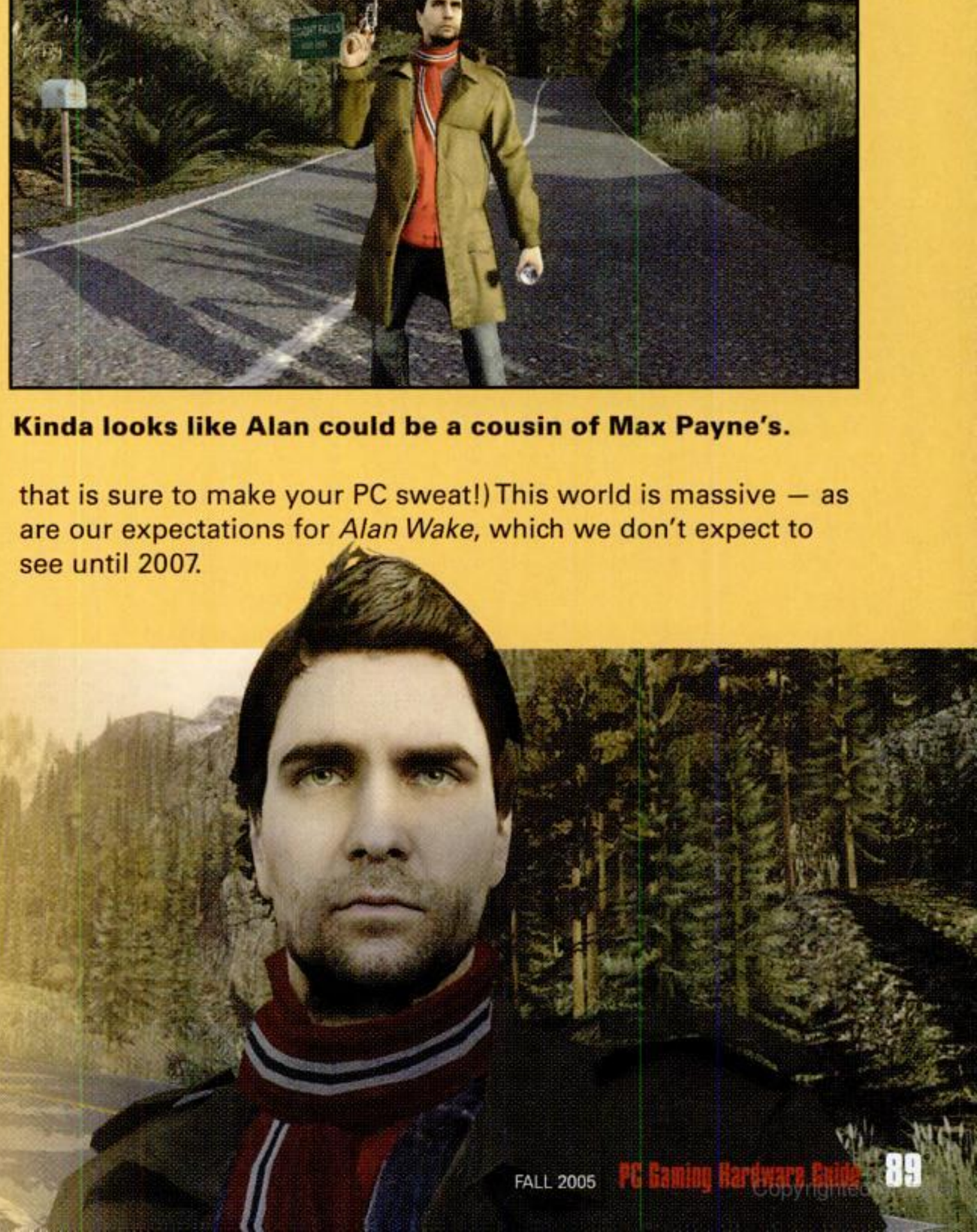
Kinda looks like Alan could be a cousin of Max Payne's.

Remedy Entertainment, the makers of *Max Payne,* have been hard at work for the last year crafting what they're calling a "psychological action thriller." Protagonist Alan Wake, a best-selling horror writer, begins to find his worst nightmares — the ones that he puts to page — coming to life. Just as Wake is starting to recover from his fiancée's mysterious disappearance, dark forces descend on the town of Bright Falls, Washington.

This aptly named location ties into one of the game's main themes, both from a story and a design perspective: light. Remedy has built proprietary technology that supports fully dynamic lighting — whereby, for example, the sun moves across the sky and changes shadows on both objects and characters. Because the developers have built a simulation of the gameworld, they can create wind, rain, clouds, light, or darkness simply by changing variables.

The upshot is not only stunning visuals, but also an almost unbelievably photorealistic depiction of shadows and darkness. The "dark men" coming for Wake are vulnerable to light, and toward that end, you'll be able to place lights to create safe zones, and use motion sensors that illuminate when triggered. Wherever you go, light will be a valuable commodity, and before the sun sets and menacing foes approach, you'll want to reach the figurative lighthouse.

Best of all, perhaps, is the sheer size of *Wake's* world, which lead designer Petri Järvilehto showed us as the camera swept (and swept...and swept...) across Bright Falls. Remedy is promising us a "free-roaming, living, open" environment to explore in what'll be a mission-based single-player experience. (And one that is sure to make your PC sweat!) This world is massive — as are our expectations for *Alan Wake*, which we don't expect to see until 2007.



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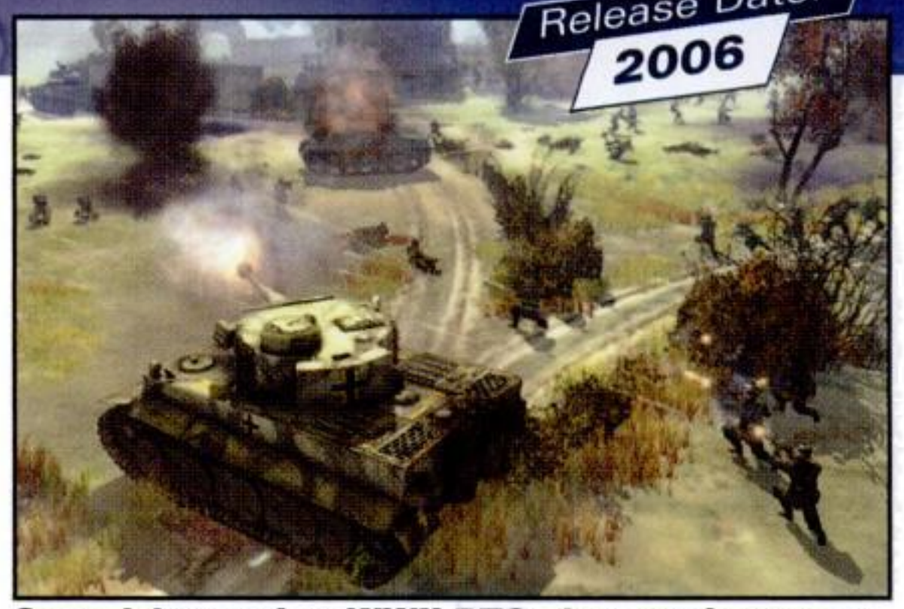
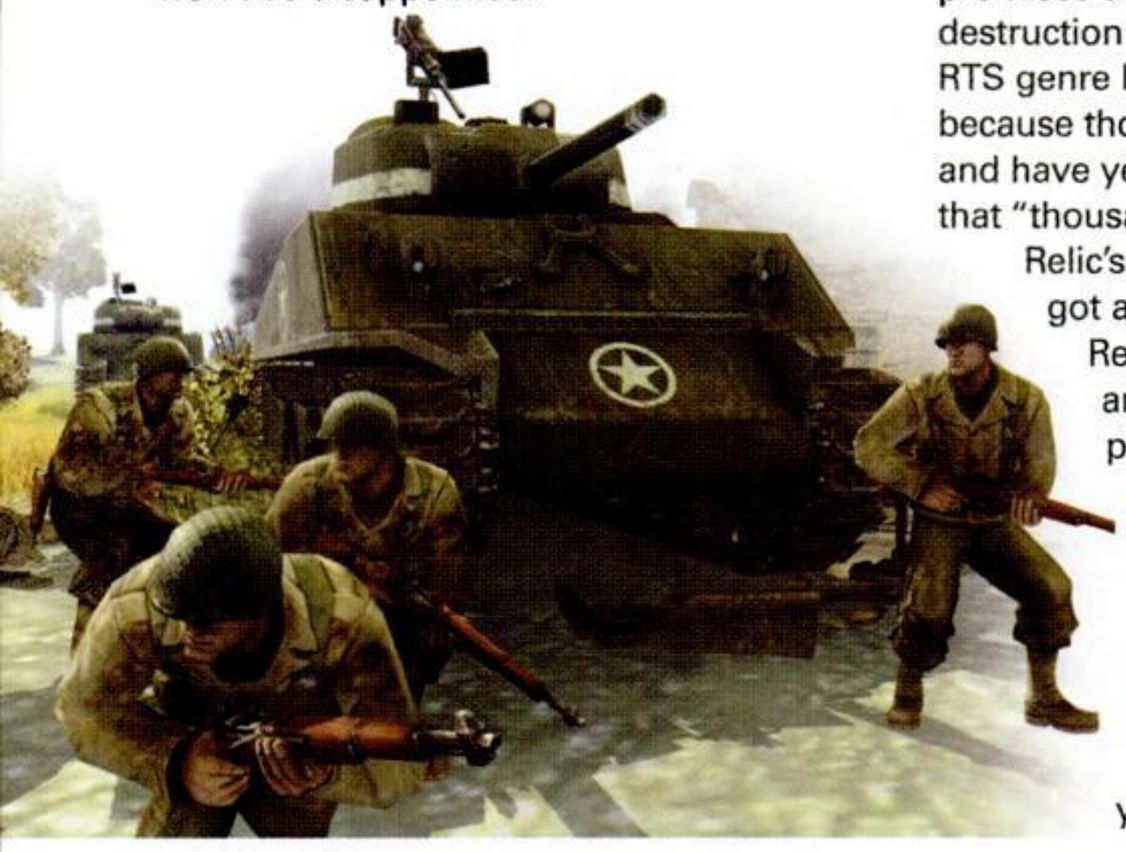
Company of Heroes

From *Dawn of War* and *Homeworld* to WWII



Sure, it's another WWII RTS—but you've never seen one quite like this!

You wouldn't expect Relic—the company responsible for the first truly 3D RTS, *Homeworld*—to make "just another me-too" World War II RTS now, would ya? Would ya, punk? Of course not, and if our early peeks at *Company of Heroes* are any indication—and we think they are—you won't be disappointed.



Heroes is all about accessible strategic gameplay that's of the "easy to play, tough to master" variety, meshed with dramatic, in-your-face visceral combat. Powered by Relic's own all-new "Essence" engine, the game promises a level of raw, cathartic destruction the likes of which the RTS genre has yet to witness. We know, because though we've only seen it in action and have yet to play it, we've already got that "thousand-yard stare." If you've played Relic's last game, *Dawn of War*, you've got an inkling of what's in store.

Relic's goal from a graphical bells-and-whistles perspective is to put Heroes on the same level as *Half-Life 2* and *Doom 3*, and we're not going to bet against them.

Graphics aside, *Heroes* also promises an unparalleled level of destruction for an RTS — all the structures and terrain you fight in and around will be fully destructible. Do you see a bunch of Krauts hiding out in a house? Well, blow it to smithereens and drive 'em out! You can even drive your tanks through buildings if you want!

An extremely detailed skeletal animation system, coupled with a ragdoll physics engine, ensures that your foes' actions, and demise, will be utterly realistic, particularly when it comes to the effect of massive incoming artillery shells, which will toss foot soldiers around like, well, ragdolls.

Naturally, all these pyrotechnics, animations, and wanton destruction will require a beefy PC to run *Heroes* in all its intended glory. All of your PC tinkering will soon be rewarded!

Rise of Legends

Screw history: Bring on the magic, genies, and killer robots!

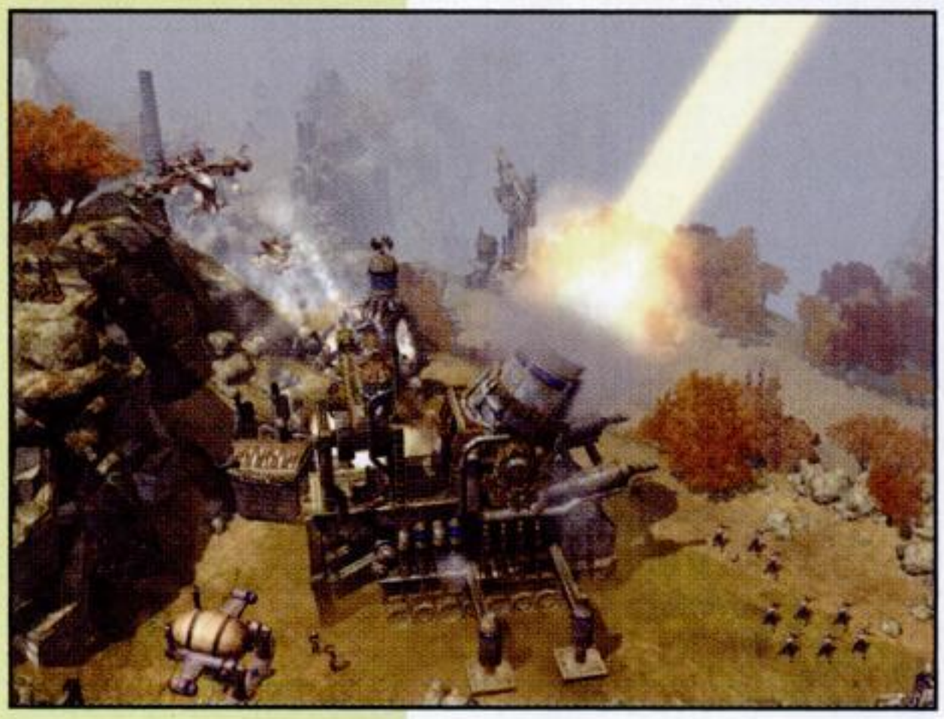
Brian Reynolds, the creator of *Rise of Nations*, is taking the series away from the already crowded historical genre and embracing a fantasy theme, but in an approach so unique that only a certified Game God could create it. In *Rise of Legends*, Reynolds pitches the field of technology against the realm of magic, giving each a distinct personality and flavor.

We played with two of the four total sides that will be seen in the game: the Vinci, a steampunk-styled race inspired by the artwork of Leonardo, and the Alim, a mystical desert clan influenced by the Arabian tales of Aladdin and Sinbad. The Vinci employ stylized clockwork machines and helicopters, while the Alim rely on magically summoned genies, dragons, and sand spirits. Each side will have access to a super-unit: a giant turret-wielding mechanical arachnid for the Vinci and a glass dragon for the Alim.

Features retained from *Rise of Nations* include dynamically shifting borders and the associated attrition damage inflicted upon unsupplied enemy troops in your territory. The overview map for the single-player campaign will also return — that's where you'll decide which land regions to attack.

This time, however, resources will be narrowed down to Timonium (which can be mined from mineral patches) and gold acquired from merchant caravans. Maintaining and defending your trade routes will be just as important here as in *Rise of Nations*.

City-building will be quite different in *Rise of Legends*. Its district feature allows you to attach various military and merchant districts to a city's central hub, creating a seamlessly connected metropolis. A fully constructed city is a wonder to behold, sporting intricate details of pedestrian activity and adding ornate flourishes to make each domain unique. And when an enemy army attacks, watch out: As your city's buildings are destroyed, the ensuing wreckage can damage nearby units. Nice!



Holy frijoles! You definitely don't want to be on the receiving end of that thing!

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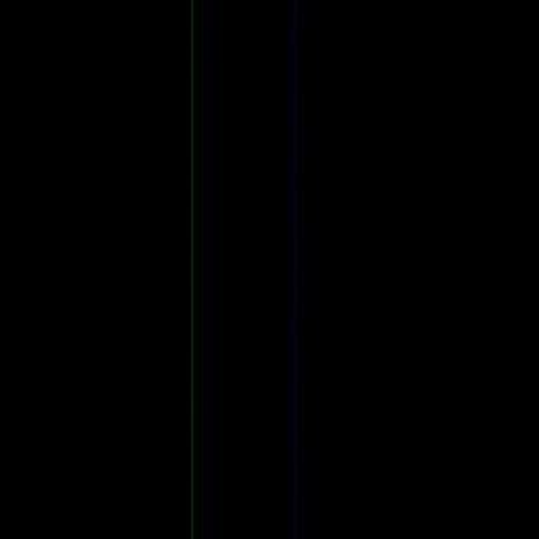

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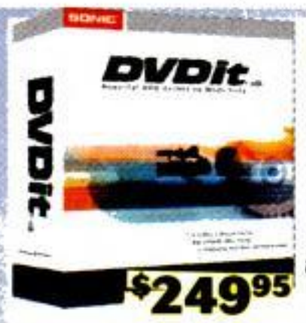

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Star Wars: Empire At War

Could we finally be getting the Star Wars RTS we've been slobbering for?

Release Date: Q2 2006

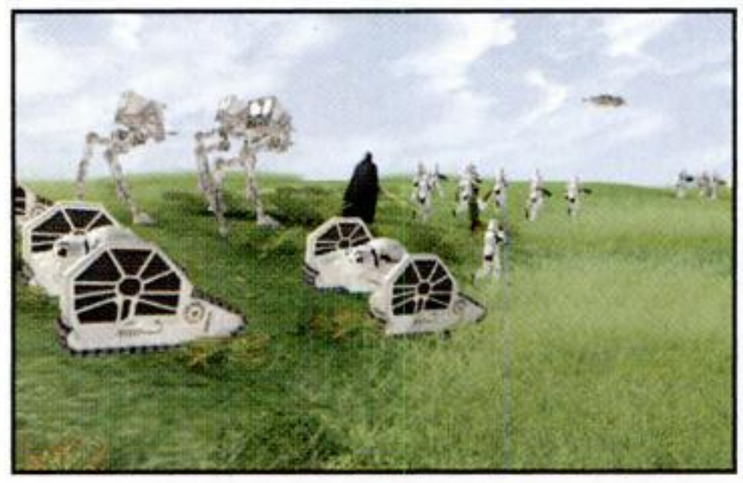
"Well, look at you, a general!"

Even after the dismal *Force Commander* (which caused millions of *Star Wars* fans to cry out in terror all at once) and the *Age of Empires II* mod that was *Galactic Battlegrounds*, there's still rabid demand for a high-quality *Star Wars* RTS game. *Empire at War* is by far the most promising-looking RTS ever shown by LucasArts, with its development in the capable hands of Petroglyph Studios, which consists mostly of former Westwood folks (*C&C: Generals, Red Alert 2*) who bailed after EA acquired the studio.

Set during the original (read: "good") trilogy, this game is all about taking total control of the galaxy as either the Empire or the Rebel Alliance. The war is spread over a board-game map that includes just about every *Star Wars* planet. Rather than wasting Darth Vader's time with resource harvesters and base-building, you gain resource points by holding territory on the galactic map. Then you'll deploy your forces to conquer more.

To take a world from your enemy, you must win two battles. First, you must defeat the enemy fleet in orbit, blasting away at capital ships and fighters to clear the way for your troop transports to land on the planet. Once there, you'll attack their ground base with legions of Stormtroopers and AT-ATs (or their Rebel counterparts), along with tons of units from the expanded universe. You'll also have access to hero units like Luke Skywalker and Vader, who carve through enemy troops like a lightsaber through bantha butter.

Better yet, you can control the Death Star and destroy entire planets, wiping them off the board. (Geek-out Alert: There's even a range countdown and a little red lever to pull and everything.) With fanboy-ish attention to such minute details, this could end up being the best, last hope for *Star Wars* strategists everywhere.

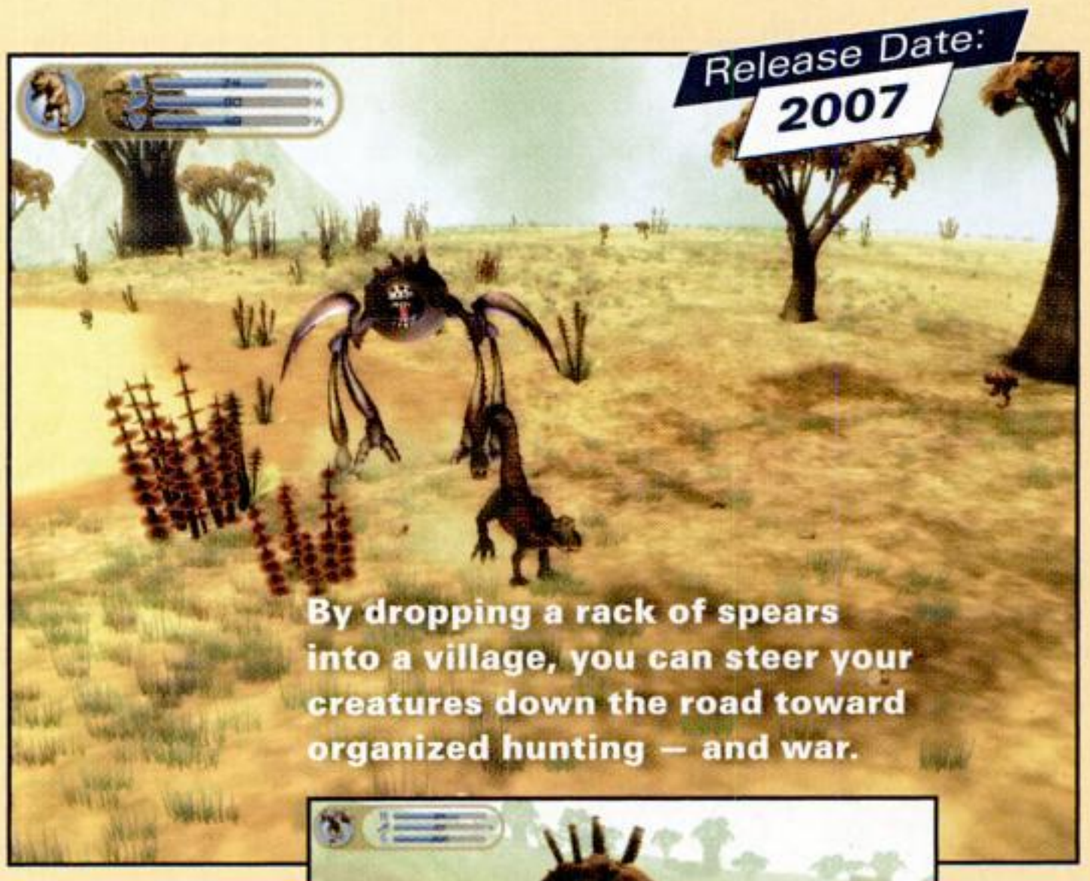


Look closely and you'll notice that's none other than Vader leading those Empire scum into battle!

Spore

The creator of *The Sims* puts you in control of the forces of evolution

Release Date: 2007



By dropping a rack of spears into a village, you can steer your creatures down the road toward organized hunting — and war.

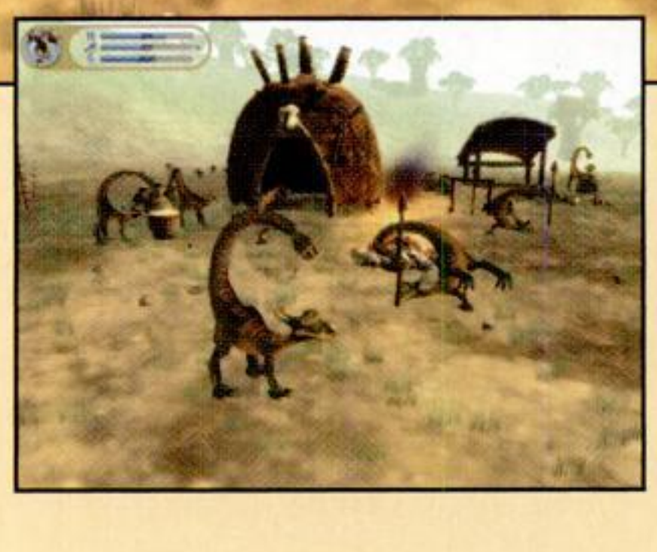
Spore is as ambitious a game as we have ever seen. Consider: It aspires to encapsulate the entire sweep of evolution, from life's origins as single-celled protozoa to the interstellar expansion of high-tech empires.

This would be dazzling enough in a game limited to human evolution. But *Spore* puts you in total control of shaping a species from the earliest beginnings of its adaptation. If you want a race of prehensile dolphins, they're yours to mold. Or maybe you'd rather craft the race of three-legged scorpion-critters that Wright showed us in a demo. Using a modular, paper-doll system, you can spend the points you earn to develop your creatures' brain, spine, limbs, and so on as you steer their biological course.

The result isn't so much one game as it is a sequence of games. At *Spore's* earliest stage, you're essentially playing *Pac-Man*, steering your hungry little protozoa through a hostile maze of primordial muck. If your little chomper survives long enough, it evolves into a more complex organism that takes its first steps on land. At that point, the game "evolves" into a creature-sim in which you forage for food, issue mating calls, and enjoy the smooth jazz that accompanies Paleolithic lovemaking. Eventually, your creatures form a simple tribe, whereupon you're playing a classic god game, dropping tools into the tribe's midst as you cultivate cultural traits ranging from warrior instincts to philosophy.

Ultimately, the action moves off-world to the conquest of space, as you use a customizable UFO to explore the stars, terra-form alien planets, and start new colonies.

At this point, you'll encounter the online element — other players' uploaded species, with which you can interact (or obliterate). Of course, you won't actually be wrecking anyone else's game, since you're only encountering copies of their creations. (Wright calls *Spore* a "massively single-player game.") But you will get feedback on how your species is faring in its interplanetary meetings.



Quite simply, the possibilities seem endless—bring on 2007!

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How To...

A step-by-step guide to tweaking your PC Experience

Master Your Videocard Control Panel

Tap into your videocard's hidden power with this detailed look at ATI's and nVidia's videocard control software

By Michael Brown

Come on, admit it: The last time you paid any attention to your videocard's display utility was when you first installed the card (or updated to the latest driver) and changed the card's default resolution and refresh rate. If that's the case, you've barely scratched the surface of your hardware's capabilities. There's a reason why ATI and nVidia employ so many software engineers: They're not only coming up with low-level tricks to make the hardware run faster, they're also developing tools that make your PC more attractive and easier to use. Whether you're a GeForce enthusiast or a Radeon disciple we'll show you how to tap into some of the most useful tools you might never have known existed.

But before we get started, visit ATI's or nVidia's website and download their most up-to-date videocard drivers (if you haven't already). We recommend uninstalling your existing display drivers before installing the new ones (ATI provides their own utility for this purpose; use Windows' Add or Remove Programs control panel to uninstall nVidia drivers).

Antialiasing and Anisotropic Filtering

Use these controls to instantly improve the visual quality of games.

Whether you're using an ATI or an nVidia videocard, one of the easiest ways to improve the look of the games you play is to tweak the amount of antialiasing and anisotropic filtering work that the card performs. As with many of the adjustments we'll show you here, this will entail a tradeoff between performance and visual quality: Increasing the level of antialiasing and anisotropic filtering will decrease frame rates. The faster your videocard, the less of a tradeoff you'll experience. Check out these screenshots to see what we're talking about.

In this shot, the videocard isn't applying any antialiasing to the scene. As a result, the straight line depicting the edge of this cliff wall has a very jagged edge. (The effect is even more pronounced in-game.)

This time, we've instructed the videocard to apply 4x antialiasing to the scene. Notice how much smoother and more realistic the edge of the cliff wall appears.

Anisotropic filtering corrects a texture's perspective when the object on which it's applied stretches deep into a scene. In this shot, we've set the card to use only 1x aniso. Notice how the water blurs as it extends to the other beach and into the horizon.

With the card set to use 8x anisotropic filtering, the water texture maintains its integrity all the way to the beach across the bay and deep into the horizon.

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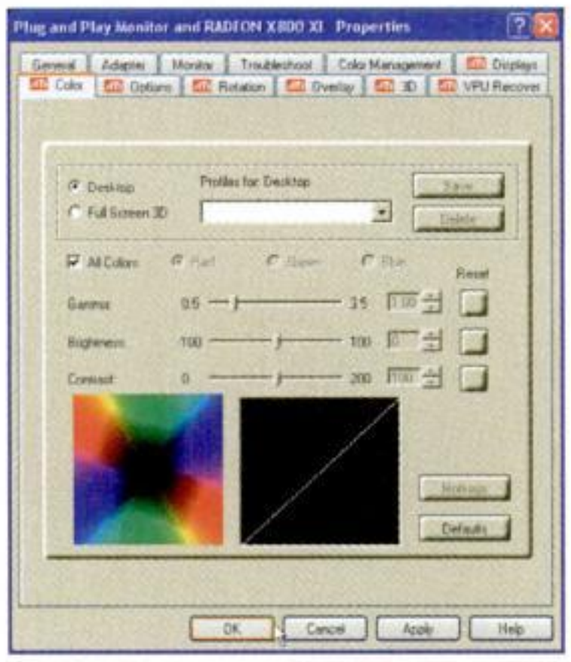
ATI Catalyst

1. Getting started

ATI offers two types of control-panel software: the newb-friendly Catalyst Control Center and the more conventional Catalyst driver. In a nod toward user friendliness, the Control Center defaults to hiding its tools within an elaborate user interface. We happen to prefer the more transparent Catalyst driver, so that's what we'll be using here.

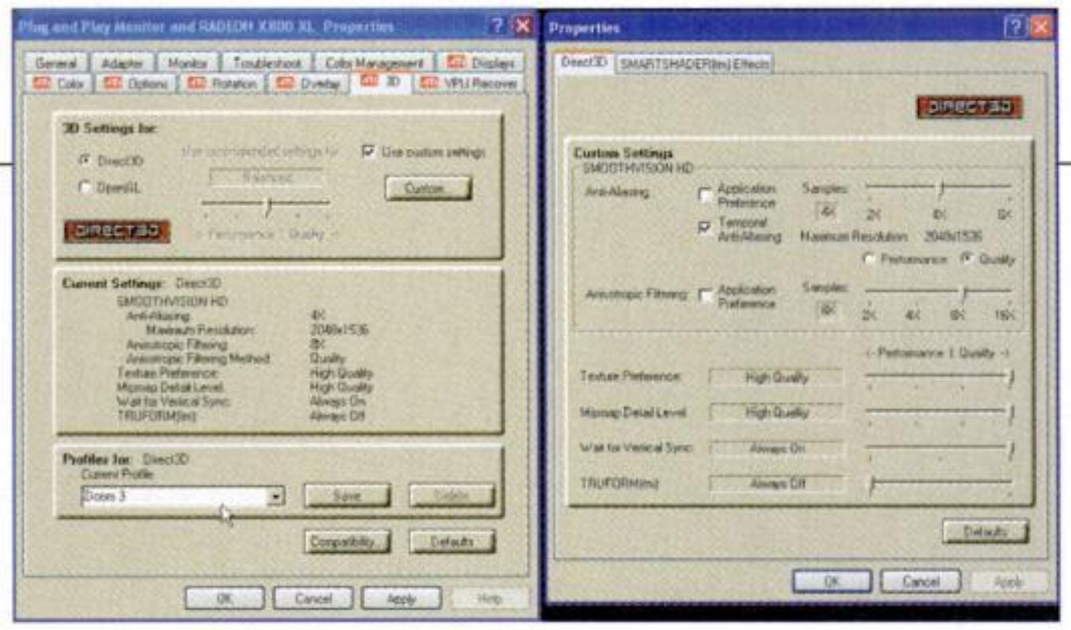
Right-click on your Windows desktop, and then sequentially click Properties from the pop-up menu, the Settings tab in the display properties window, and then the Advanced button. Next, click the Options tab and compare the Catalyst version displayed here to the latest version available on ATI's website.



We favor the straight-forward Properties window over ATI's newb-friendly Catalyst Control Center.

2. Creating profiles

Click on the 3D tab and you can define custom profiles for each game you play. The first step is to click the radio button to choose between creating a profile for either a Direct3D or an OpenGL app. Using the slider on this tab, you can adjust global settings (displayed in the box beneath the slider) to obtain all-out performance at the expense of image quality, optimal visual quality at the expense of performance, or a happy balance. Advanced users, however, will tweak individual settings by placing a checkmark next to "Use custom settings" and then clicking the Custom button to open the Direct3D (or OpenGL) Properties window.



ATI's driver provides tools to create custom profiles for games and other 3D applications.

By default, Catalyst allows applications to control settings such as antialiasing and anisotropic filtering, but you can easily override these choices within this window—simply remove the checkmarks next to Application Preference. Boosting these settings will improve image quality, but reduce performance. Click the Default button to return the settings to factory spec.

Once you've customized your Catalyst settings, save the profile by typing a unique name in the Custom Profile box and clicking the Save button. You can create a different profile for each game, if you'd like; but since the driver defaults to the profile that was active when you shut down your PC, you'll need to change the profile each time you switch programs.

nVidia Forceware

1. Getting started

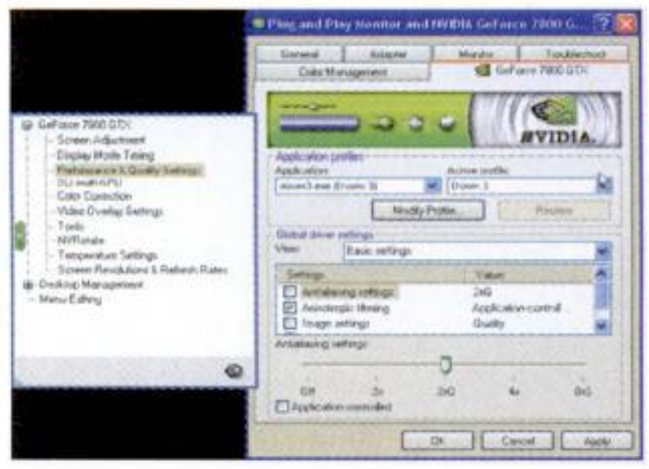
To access your nVidia card's most powerful tools, right-click on your Windows desktop, and then sequentially click Properties from the pop-up menu, the Settings tab in the display properties window, and then the Advanced button. Next, click the GeForce tab. The GeForce tab tells you everything you need to know about your videocard. If you want to know if you have the latest videocard driver installed, compare what you see here to nVidia's website. But the menu attached to the left side of the videocard properties window is where the action is.

Some of the tips we'll discuss depend on nVidia's nView Desktop Manager features being activated, so let's do that now. Click Desktop Management in the left-hand pop-out menu, and then move your mouse back to the main GeForce menu. In the nView Desktop Manager box, click the Enable button. This will open a new set of Desktop Management options in the pop-out menu.

2. Tweaking profiles

nVidia has created custom display profiles for a broad range of applications, including many popular games. Click "Performance and Quality Settings" in the left-hand pop-out menu to access these profiles and you can easily tweak them to your own preferences or even create new ones from scratch. For games you regularly play in both single and multiplayer mode, consider defining a single-player profile that trades a little performance for enhanced visual quality, and a multiplayer profile that compromises some visual effects in the name of faster frame rates.

Tweak nearly every aspect of your nVidia videocard from within this properties window.



Use nVidia's application profiles to set specific display parameters for your favorite games.

Profile settings reflect the options that are available within a given application. Choose the *Doom 3* profile, for example, and you'll see settings for antialiasing, anisotropic filtering, image quality, and vertical sync. AA and aniso have an additional checkbox, labeled "Application Controlled." If this box is checked, the driver will use the settings defined within the application. If the box is ghosted, AA and aniso options are not available in this app.

When you're finished, click the Modify Profile button and save the profile under the same name, so that it's automatically activated when the application is launched. You can easily restore nVidia's original profile by selecting it from the list and clicking the Restore button.

Follow similar steps to create a new profile from scratch: Set the application listed under Active Profile to "global driver stettings," click Add Profile, and give the new profile a name. You can associate this profile with any application listed in the window. If the application you want to work with isn't listed, you can add its executable to the list by clicking the Browse button and searching for it. ■

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MA 9/05

The Game Doctor Is In!

Symptom ▶ Diagnosis ▶ Cure

DO EMULATORS DREAM OF COPYRIGHTED SHEEP?

I purchased *Doom 3* and *Call of Duty: United Offensive* from Activision. When I try to run these games, I get a notification that I have CD emulation software running. Inspection of the Device Hardware section of the Control Panel indicates none installed. I've had emulation software installed in the past, but not currently. Any idea what is left in my machine that's tripping the copy-protection software into thinking I have that software installed?

—STEVE GRAFLUND

The Doctor appreciates your restraint, Steve. Usually, these letters read more like "I PAID for this #$&@! game and the @$#&! won't @*$#! work. Damn them all to hell!" and so on.

You didn't mention which CD emulator you had installed in the past. If it was *Daemon Tools*, try reinstalling and then uninstalling the application to remove any detritus that may have been left behind by a prior uninstallation. If this doesn't work, go to www.daemon-tools.cc, and on the home page, Daemon Tools Help (to the left of the screen). Then click Uninstallation, and follow the instructions to manually remove the application.

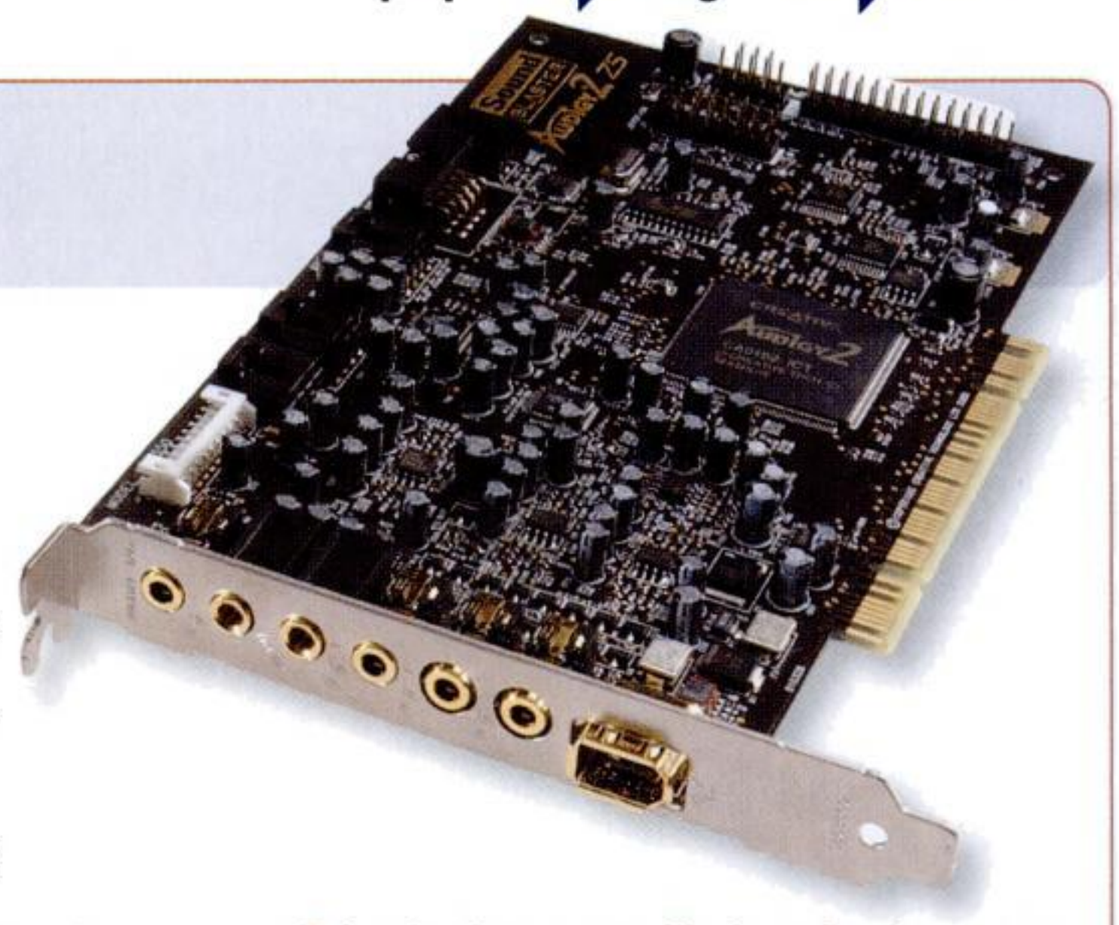
If you've ever used Ahead's *Nero ImageDrive*, you'll have to completely uninstall the application and reinstall it again without activating *ImageDrive*. That's right—even if you've disabled *ImageDrive*, using it even once installs a driver that Activision's copy-protection doesn't like.

Also, Activision's support page (www.activision.com) offers uninstallation advice for some programs.

In the Doc's opinion, this heavy-handed approach to copy-protection only punishes the consumers who actually buy the game, without even slowing down pirates. It's maddening that the legitimate software still refuses to operate even when CD emulation is disabled. Unfortunately, your only recourse is to vote with your wallet and return games to the store from which you purchased them if they won't install on your machine.

"Copy protection makes me angry!"

AUDIGY ACTING UP



Following a recent LAN party, my computer refused to boot. After some thorough testing, I found that the naughty piece of hardware was my Audigy soundcard. It caused the system to randomly lock up, and refused to accept drivers. I hate my non-EAX onboard sound. Is there any hope, or has my card seen its final days?

—RUBEN MARTINEZ

Creative's soundcards are known to have issues when interacting with mobos equipped with VIA's 686 southbridge, but assuming you don't have such a motherboard, there are a couple things you can try to solve your problem.

The Doc recommends that you first try the Audigy card in a completely different system to see if it's still functional. If it misbehaves in that box, send it to the spice mines of Kessel. If you find that the card works in the alternate box, then it's time to examine your system. Try plugging the card into another PCI slot, getting the latest BIOS and chipset drivers for your motherboard, and possibly moving your other PCI devices around to see if that solves a conflict. Furthermore, onboard devices on new motherboards work by bridging through the PCI bus. Try disabling a few onboard devices to see if the problem clears up. Of course, running this all on a clean install of Windows XP may also help solve the problem. If none of this works, then you've got a nice new doorstop.

Take the time to troubleshoot hardware you think is bad before tossing it in the bin!

VIDEOCARD DISPLAYS WEIRD SPOTS

I have an ATI Radeon 9600 XT 256MB videocard that has been bugging me for a long time. When I play *Need for Speed: Underground* and *Prince of Persia*, the graphics start to break down. The screen shows a lot of weird blemishes and you can hardly even see what's happening. I've already updated to the latest driver. I have e-mailed ATI and all I got back were some directions that I've already taken into consideration.

—GEORGE

The problems you describe are representative of one of two things: either your card is overheating or

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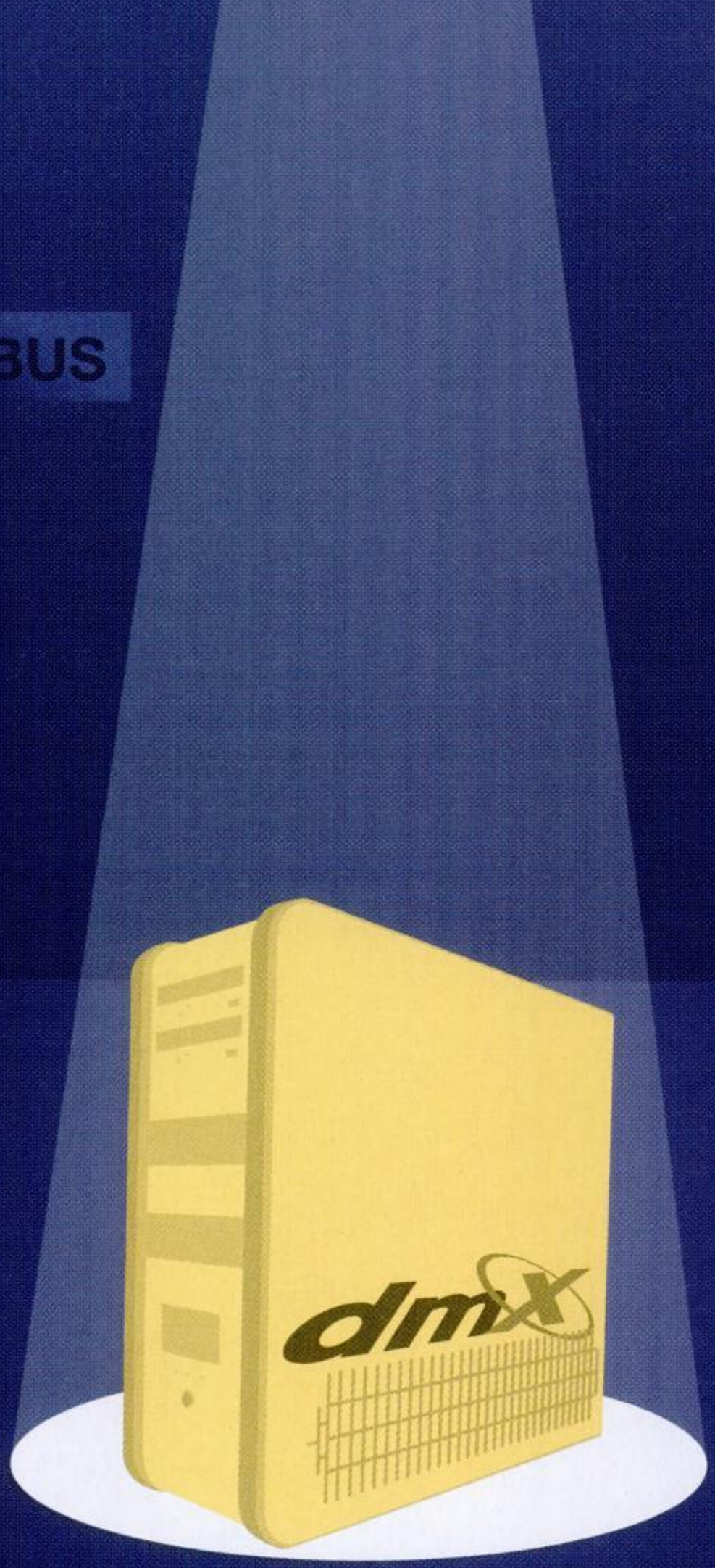

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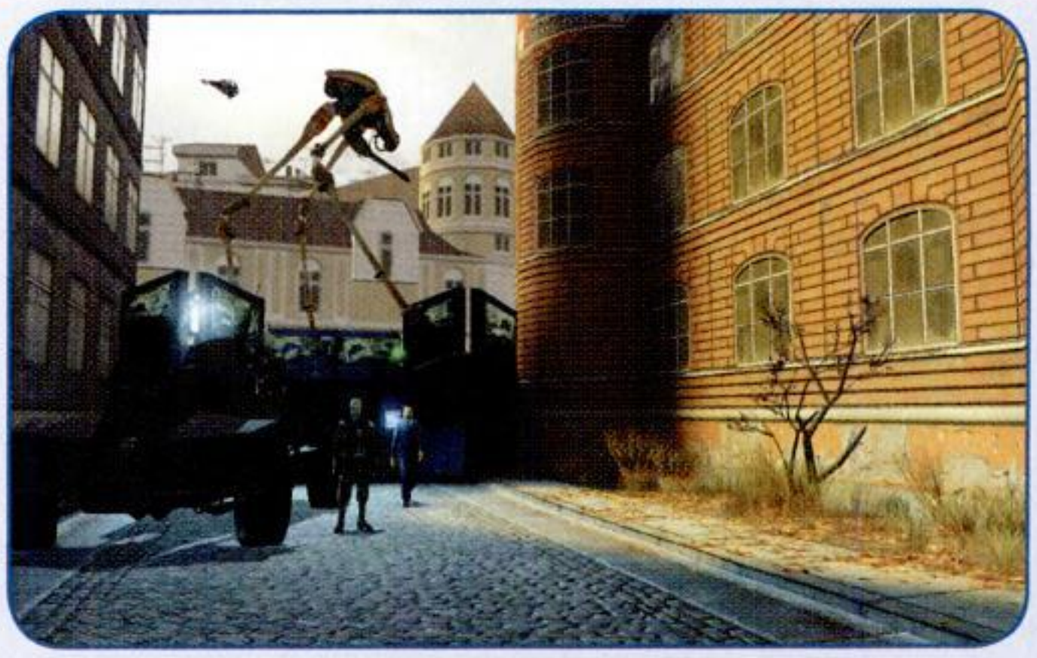
The Game Doctor Is In!



MOTION SICKNESS IN HALF-LIFE 2

I have been looking around in the forums and I have seen plenty of articles about motion sickness in *Half-Life 2*. I've played *Doom 3, Far Cry, Joint Ops,* and a slew of other games on the same PC and *Half-Life 2* is the only one that makes me want to throw up. Any ideas to reduce this problem?

—MIGUEL

Does playing FPS games make you hurl? Try some ginger root!

We used to think this was an issue limited to little girly-men, but our own Logan Decker experiences the same problem. He recommends cures that also work for seasickness. Try chewing a little ginger root, or if that doesn't work, some people say Dramamine helps.

CALL IT VIRTUAL VOMIT SYNDROME

I've suffered from game-induced motion sickness ever since I first played *Wolfenstein 3D*. The problem occurs when your brain receives movement signals from your eyes, while your inner ear tells your brain that you're standing still.

I've found that the higher the frame rate, the more intense the nausea. So the solution is to crank up the visual-quality settings and resolution to get that frame rate down. You should also disable any weapon-bob effects. The constant motion of the weapon only makes the problem worse.

There are several alternative cures. Ginger is a good one. You don't have to chew the root, though. You can get ginger capsules at health-food stores, and I've had lots of luck with the new ginger-flavored Altoids. Ginger ale is less potent, but also works for some people. Ginger beer packs a lot more kick.

If ginger doesn't work for you, suck a lemon. Seriously, a shot glass of lemon juice seems to help some people, especially for those folks who find ginger ineffective.

The best news is that while it's uncomfortable, you can build up a tolerance, to the point that you're no longer affected. I used to get hit hard back in the days of the 386 and the original *Doom*, but after a while the nausea and dizziness simply went away. New games and new camera techniques bring it back, but once you're on the road to recovery, it's generally slightly less problematic each time you play.

—DAN AMRICH

MEMORY ADVICE FOR A NEWBIE

This is my first time building a computer and I was wondering if you could give me some advice. I plan on getting a GeForce 6800 Ultra and already have an Athlon 64 4000+ picked out. Is there any performance boost in gaming above 1GB in memory? The motherboard supports up to 4GB of RAM, but how much is really necessary?

—KEVIN ELLIS

Right now, the sweet spot for performance gaming is at the 1GB mark, but we are rapidly approaching the day when that won't be enough. You may see a slight performance increase with more memory in some MMORPG titles, but for the most part, 1GB is sufficient. Some might even argue that 1GB is optimum because most 512MB modules, which you'd use for a 1GB total, have better latencies than the denser chips used to make 1GB modules, which you'd need for 2GB of total RAM. The Doctor's advice: If you have cash to burn or you work with very large memory-intensive applications, buy 2GB. Otherwise stick with 1GB.

WIDE-ASPECT GAMING

I'm not sure what the right forum is for this question, but I was hoping for your opinion. I'm going to buy a 20-inch flat panel. The problem is, I'm not sure whether to get a normal-aspect screen such as the Dell 2001FP or the wide-aspect screen such as the Dell 2005FP. The display is primarily for playing games like *Doom 3, Half-Life 2,* and *World of Warcraft*. What do you think?

—T.M. CHICAGO

We've actually played all of these games with both normal 4:3 and 16:9 aspect ratio displays, and been pleased with both types. The secret is to use appropriate 16:9 resolutions in your game—1900x1200 and 1280x960 are both wide-aspect ratios. If you run 4:3 resolutions—1024x768 and 1600x1200—your display will have to stretch the pixels to fit, and your picture will be distorted. Of course, while all three of the games you mention work well with widescreen displays, other games offer only 4:3 resolutions.

If your chosen game supports 16:9 resolutions, a wide-aspect screen could be a worthy upgrade.

The Doc's got the cure for what's ailin' your PC. Drop him a line describing your symptoms, and he'll do his level best to whip up a remedy.
— **doctor@maximumpc.com**

THE GAME DOCTOR IS IN!

I MUST HAVE MY DOOM 3

I recently broke the bank and bought some upgrades for my computer hoping to maximize my *Doom 3*, *Half-Life 2*, and other gaming experiences. I have a problem, though. I have an Asus A7N8X-E motherboard, an AMD Athlon XP 3200+, 2GB of memory, and a GeForce 6800 Ultra videocard. The system works fine; however, my frame rates in *Doom 3* suck! Testing with Fraps, I hit a high of 32fps (1024x768 with Ultra Quality and 8x AA). I figured this was a fluke, so I loaded *Unreal Tournament 2004* and got 150-plus frames per second with everything cranked up and running at 1280x1024! Is there something wrong with my settings? I read your review, and you guys got more than 80fps with this card and *Doom 3*. Please help me on this! I'll renew my subscription for five years if I can hit at least 80fps with *Doom 3*!

—DAVE HACKETT

Unfortunately, Dave, your performance in *Doom 3* will be limited by your CPU's slow performance. The Athlon XP simply lacks the horsepower that *Doom 3*'s next-gen graphics engine demands.

For the record, when we test *Doom 3*, we run it at 1600x1200, 4x antialiasing and 4x anisotropic filtering, using the High Quality setting. The Ultra Quality setting is for cards with more than 256MB of video memory. By using the Ultra setting on a 256MB card, your card has to expend mucho effort swapping high-resolution textures in and out of video memory. However, even if you drop to High Quality mode, it's unlikely you'll see 80fps on your current system.

I NEED MY 3D

I own an nVidia GeForce2 MX 400 videocard, and I recently noticed that when I try to load any games off the Maximum CD (bundled with this magazine), it says I don't have a videocard. I can install games, but when I go to play them, I have no such luck. Is there any way to fix this?

—NICOLAS BEDARD

You're singing the my-videocard-is-too-old-to-play-this-game blues, Nic. The GeForce2 MX chipset lacks the programmable-shader support that's crucial to many of today's games. The good news is that you can get a decent videocard for less than $200. We recommend the GeForce 6600 series of boards for gamers on a budget.

POWER CORRUPTS

I built my first PC a few months ago, and things were fine for a while. Over the past few months, however, I've experienced problems with crashes not only during gaming sessions, but also during regular use (e.g., surfing the web, and so on). My monitor will go blank and I'll hear high-pitched sounds coming from my speakers until I shut the system down via the power button. I thought the problem might stem from an overheated videocard, but the temperatures seem to be fine. I am running a lot of hardware, including two Raptors, a GeForce 6800, and seven case fans, so my next guess was related to the power supply. To test that theory, I unplugged everything except for the graphics card and the hard drives; sure enough, the system stabilized for a while. I had to use an optical drive one day, so I plugged it in and the system crashed. I unplugged the drive, and Windows worked fine; but even with everything disconnected, I still get an occasional hard crash. Is it a safe guess that my 500-watt MGE PSU has a bad power rail or two? Or could it be something else?

— DANTE JONES

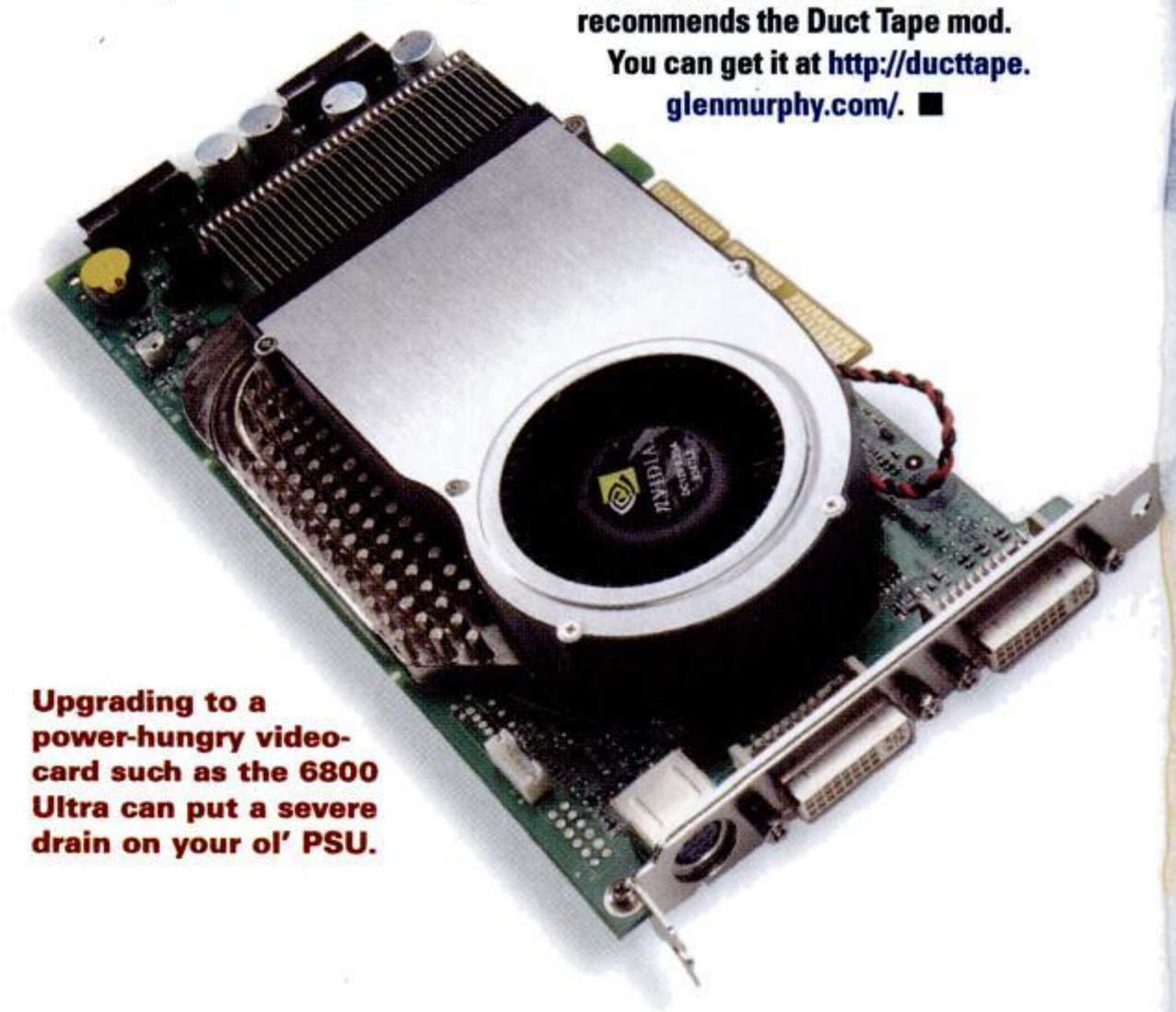
It sounds like you've done a good job of troubleshooting, and we agree with your diagnosis that the problem probably stems from your power supply. The GeForce 6800 is a power hog, especially if it's the Ultra model (the AGP version of which requires two power connectors). Before you toss your PSU, though, you should verify that you've properly wired your components. You don't want to power your hard drives using six Y splitters, for example. The power cables running to your videocard should be dedicated lines, too. You should also make absolutely sure your problems aren't being caused by a simple ventilation problem or a bad stick of RAM. To eliminate those variables, run the software utility memtest86, which is available for free (the authors accept donations) from www.memtest.com. There's an outside chance that bad RAM coupled with a borderline-under-performing power supply could be the culprit.

HERE'S A BRIGHT LETTER

I have a ViewSonic E790 monitor, and for the most part it works great. But in some FPS games it's too dark in tunnels or dark rooms. I have the videocard set to high brightness and contrast. The monitor's controls are also set on the high side. I have an ATI 9800 Pro videocard, and the detail in the games is great. Do you feel that the monitor is the problem?

—DAVID RATCLIFF

First, we recommend that you experiment a little with the videocard controls. Having both the brightness and contrast set too high could actually diminish some of the detail in dark areas. Adjust the controls independently, and see if that improves the image. Next, try the same independent adjustment of the onscreen display settings. If you're still finding scenes too dark in games, it's quite likely your issue is with the games themselves—the tunnels and dark rooms you're finding too dim are probably intentionally that way. This hunch is strengthened by the fact that you're satisfied with the monitor's performance in other applications. If *Doom 3* in particular is giving you problems, the Doc recommends the Duct Tape mod. You can get it at http://ducttape.glenmurphy.com/. ■



Upgrading to a power-hungry videocard such as the 6800 Ultra can put a severe drain on your ol' PSU.

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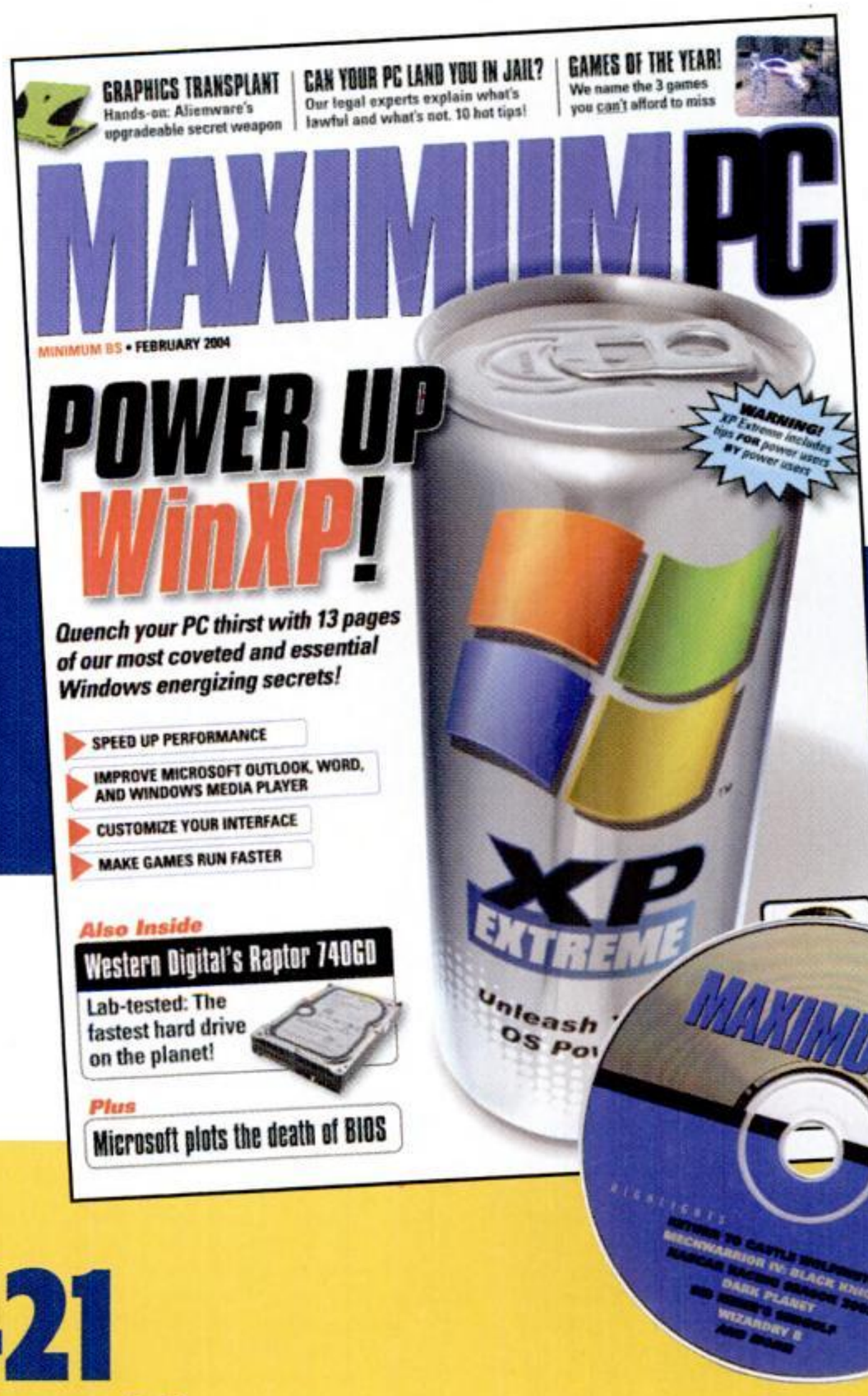
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The Great Videocard Giveaway!

Maximum PC's teamed up with nVidia and XFX to give you a chance to win the ultimate PC upgrade: a brand-spanking-new GeForce 7800 GTX videocard!

Maybe you're planning on asking Santa for one, but a backup plan can't hurt: You could win a new videocard—just in time for the rush of new holiday games! We're giving away two new PCI-Express cards, courtesy of XFX and nVidia, and 10 copies of *Serious Sam 2*.

1st prize
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2nd Prize
NVIDIA GeForce 6800 GT, courtesy of XFX

3rd Prize
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The best part? You have to do hardly anything for your chance to win: we're not going to make you send in any embarrassing photos or even break a sweat answering any trivia questions! Just send in your entry (see details below)!

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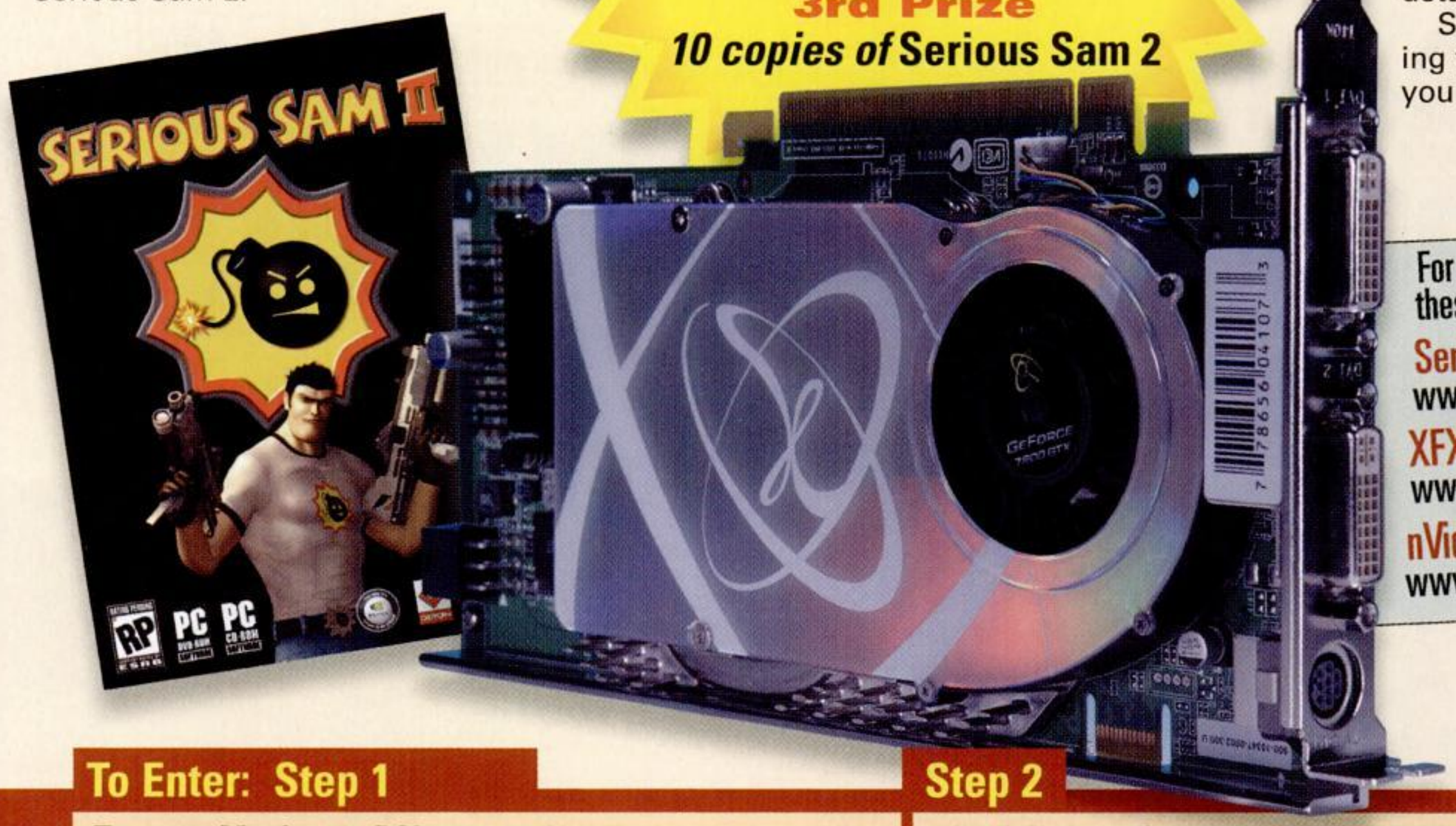

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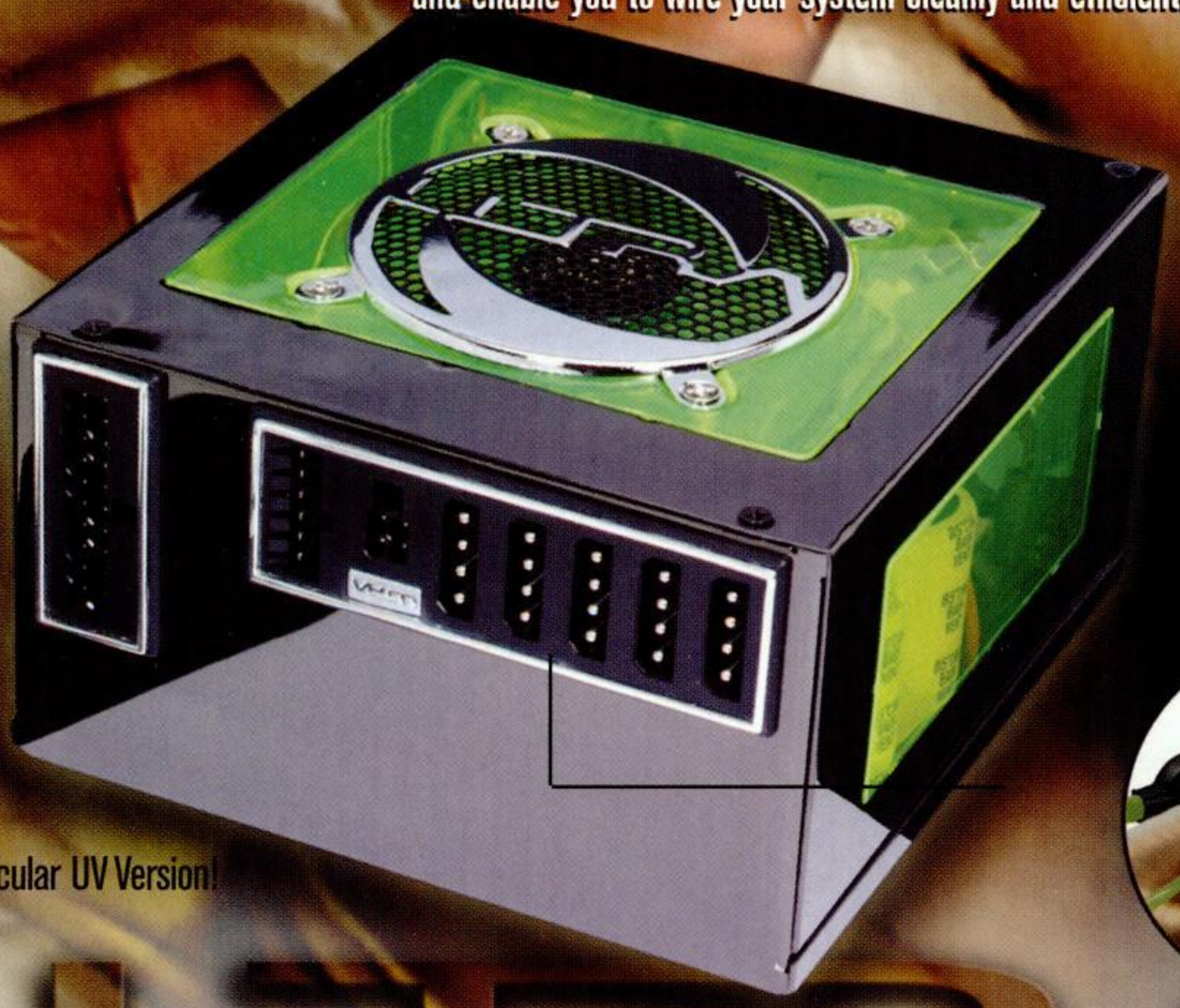

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